EXAMINING THE CONGRUENCE BETWEEN AN ANTECEDENT BASED DESCRIPTIVE ASSESSMENT METHODOLOGY AND FUNCTIONAL ANALYSIS TO IDENTIFY THE FUNCTION OF PROBLEM BEHAVIOR FOR CHILDREN WITH AUTISM

By

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EXAMINING THE CONGRUENCE BETWEEN AN ANTECEDENT BASED DESCRIPTIVE ASSESSMENT METHODOLOGY AND FUNCTIONAL ANALYSIS TO INDENTIFY THE FUNCTION OF PROBLEM BEHAVIOR FOR CHILDREN WITH AUTISM

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Currently, descriptive assessments (correlational assessments) are commonly used to develop hypotheses regarding the function of problem behavior for students with disabilities. However, no methodology of descriptive assessment has emerged as the most valid and reliable method of conducting functional behavioral assessments. The purpose of this study is to examine the congruence between a descriptive assessment based on the correlation between problem behavior and antecedent events, and an experimental analysis of problem behavior (functional analysis). Functional analyses and descriptive assessments were conducted for 3 students with autism, or autism spectrum disorder, who exhibited problem behavior. Descriptive assessments involved an analysis of the occurrence of problem behavior during three pre-selected antecedent conditions: (a) the presence or absence of adult attention, (b) the presence or absence of tangible items, and (c) the presence or absence of demands. Assessments were conducted in both the home and school setting for each student. The results of the study revealed that descriptive assessments of antecedent events are only occasionally predictive of the results of a functional analysis. More research is needed in order to determine the validity of direct descriptive assessments.

CHAPTER 1
INTRODUCTION

Overview

Educating children with autism spectrum disorders has been an ongoing challenge for researchers and educators. Autism spectrum disorders (ASD) are a complex set of developmental disabilities that includes the classification of autistic disorder, Aspergers Syndrome, childhood disintegrative disorder, Rett disorder, PDD-NOS, and atypical autism disorder (American Psychiatric Association, 1994). The core behavioral characteristics of ASD include impairments in socialization, verbal and non-verbal communication, and restricted and repetitive patterns of behavior (American Psychiatric Association, 1994). In addition to these characteristic behaviors, many children with autism exhibit behavioral excesses. Frequently reported behavioral excesses include self-injurious behaviors (e.g., head hitting or head banging), stereotypic behaviors (e.g., rocking, hand flapping), and disruptive behaviors (e.g., tantrums, aggression) (Charlop, Shreibman, & Kurtz, 1993). Such behaviors are particularly problematic because they often interfere with learning, and have been reported as the major cause of exclusion from general education settings for children with ASD (Charlop, Shreibman, & Kurtz 1993; Reichle, 1997).

There is a significant and ongoing need to design effective interventions in order to reduce problematic behaviors for children with ASD. Traditional treatments (e.g., psychoanalytic, neurological, pharmacological) have viewed autism as a homogeneous syndrome, where one treatment is effective for all children with the disorder (Charlop et al., 1993). This view is problematic because children with autism are quite different from one another. Applied behavior analysts proposed an alternative model for treating autism. In the behavioral model, autism is viewed not as a homogeneous syndrome but as a cluster of specific behaviors that can be measured, observed, and modified (Charlop et al., 1993). In general, the behavioral model of intervention aims to manipulate the children's environment in order to reduce behavioral excesses and increase adaptive behaviors. The behavioral model has been empirically demonstrated to be effective in reducing problem behavior for children with ASD (Charlop et al., 1993).

Behavioral Intervention Model

Behavioral interventions are a useful tool in the treatment of problem behaviors for children with ASD. A basic tenet of behaviorally based interventions is that problem behaviors are learned (Baer, Wolf, & Risley, 1968; Skinner, 1953). Thus, problem behaviors can be reduced or replaced through environmental manipulations. Behavioral treatments are those aimed at increasing appropriate behavior and decreasing inappropriate behavior through the utilization of basic behavioral principles (e.g., positive reinforcement, negative reinforcement, punishment).

Prior to 1982, behavioral interventions were typically implemented without any pre-intervention assessment (Mace, 1994; Mace, Lalli, & Lalli, 1991). Interventions such as time-out, differential reinforcement, and token economies were implemented based on behavioral form, or topography, in an attempt to reduce problem behavior (Carr, 1977). This approach was generally referred to as behavior modification (Mace, 1994). Although these techniques proved useful in some cases, the generality of treatments across children was limited (Durand & Carr, 1987; Repp, Felce, & Barton, 1988). In addition, no specific guidelines existed for selecting alternative interventions when initial interventions were not effective (Mace et al., 1991).

In 1977, Carr suggested that interventions designed to reduce problem behavior should be linked to the motivational factors contributing to the problem behavior (i.e., the function of problem behavior), rather than the topography of the behavior. Carr reviewed the literature on the function of self-injurious behavior, a common form of problem behavior for persons with developmental disabilities and ASD. In the review, Carr identified several hypotheses regarding possible functions of problem behavior. These functions included (a) the ability to gain access to social attention or tangible items (positive reinforcement), (b) the reduction of aversive stimuli, such as escaping from an unpreferred activity (negative reinforcement), or (c) the production of sensory stimulation (automatic reinforcers).

Based on Carr's (1977) hypotheses, Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994) devised a method to experimentally test for the behavioral function of problem behavior. In a methodology termed functional analysis, persons with self-injury were exposed to four experimental conditions designed to test for a behavior's sensitivity to positive reinforcement, negative reinforcement, or automatic reinforcement. Iwata et al. found that functional analyses served as a useful tool in identifying the variables maintaining problem behavior.

Important advances in the methods used to manage behavior problems have arisen from the work of Carr (1977) and Iwata et al. (1982/1994) in the area of applied behavior analysis (ABA). In addition, the reauthorization of the Individuals with Disabilities Act

(P.L. 105-17; Individuals with Disabilities Education Act Amendments of 1997) has created a need to adapt these methods for use in the classroom. According to IDEA, a functional behavioral assessment (FBA) must be conducted for students exhibiting behavior problems that have led to suspension from school for over 10 days. Functional behavioral assessment is a broad term representing pre-intervention assessment procedures designed to determine the variables controlling and maintaining problem behavior. Factors maintaining problem behavior may include the ability to gain access to social attention or tangible items (positive reinforcement), the reduction of aversive stimuli, such as escaping from an unpreferred activity (negative reinforcement), or the production of sensory stimulation (automatic reinforcers). Developments in ABA over the past 20 years suggest that interventions designed to reduce problem behavior are most effective when they are linked to the function of the problem behavior (Mace et al., 1991).

Conducting a Functional Behavioral Assessment

Although IDEA calls for the use of functional behavioral assessments, the law does not define the actual process of assessment. Subsequently, a variety of methods and procedures have been used to conduct functional behavior assessments. The two most common techniques are descriptive assessments and experimental analyses. Descriptive assessments examine the environment-behavioral interactions occurring in the natural environment in order to identify variables hypothesized to contribute to problem behavior. Commonly used descriptive techniques include indirect measures (e.g., interviews with parents and teachers), and/or direct measures (e.g., naturalistic observations) of environment and behavior interactions. Experimental analysis involves direct manipulation of antecedents and/or consequences and has typically been conducted in controlled laboratory settings.

Continuing disagreement persists regarding the most effective methodology for conducting functional behavioral assessment (Mace & Lalli, 1991). Proponents of descriptive methods argue that the optimum control provided in the experimental analog setting may be problematic (Day, Horner, & O'Neill, 1994; Sasso et al., 1992). For example, critics argue that consequences delivered in experimental conditions may not be identical to those maintaining the behavior in its natural environment (Sasso et al., 1992). Therefore, researchers conducting experimental analyses may overlook important variables operating in the natural setting, and hence, the results may not generalize outside the analog setting (Mace, 1994). An additional problem cited with experimental analyses is that practical limitations sometimes preclude its use in certain situations (Sasso et al., 1992). For example, limitations in staff, time, or facilities may limit the ability to conduct experimental analyses (Lennox & Miltenberger, 1989). In addition, experimental analyses may require some degree of expertise, limiting its use to only those with training (Sasso et al., 1992).

Despite the limitations in experimental analyses, researchers have yet to identify instances when descriptive techniques reliably and validly identify behavioral functions. Indirect descriptive assessments are problematic because they are often unreliable and results are not replicable (Chait, 2001; Sturmey, 1994; Zarcone, Rodgers, Iwata, Rourke, & Dorsey, 1991). Direct descriptive assessments provide a more objective, accurate indication of the naturally occurring behavior-environment interaction (Bijou, Peterson, & Ault, 1968). However, the validity of direct assessments remains unclear (Chait, 2001).

Several researchers have found direct descriptive assessments to produce results congruent with those found in an experimental analysis (Belfiore, Browder, & Lin, 1993; Freeman, Anderson, & Scotti, 2000; Sasso et al., 1992). However, these findings are not consistent across studies (Hall, Neuharth-Ptitchett, Belfiore, 1997; Mace & Lalli, 1991). In addition, variations in the methodology used to collect and analyze descriptive observations persist. To date, no methodology of direct descriptive assessment has emerged as the most valid and reliable method of conducting FBA.

More research is needed in order to determine the validity of direct descriptive assessments. In particular, research is needed comparing the results of direct descriptive assessments to an experimental analysis (e.g., functional analysis).

Statement of the Problem

The literature on FBA has identified several methods of conducting direct descriptive assessments. However, little attention has been directed toward identifying and modifying procedures to improve their utility (Freeman et al., 2000). In fact, variations in the methodology used to collect and analyze descriptive data make it difficult to determine an effective and efficient methodology for conducting direct descriptive assessments. This study aims to examine the concurrent validity of a descriptive assessment method by comparing the results to the findings of a functional analysis. In particular, the direct descriptive assessment will examine the relationship between problem behaviors and antecedent events (establishing operations). Such an analysis will provide information regarding the relative importance of antecedent events when conducting direct descriptive assessments. In addition, this study will contribute to the literature on direct descriptive assessments by identifying methods that are valid and useful in the assessment and treatment of problem behavior.

Experimental Questions

The study is designed to answer the following questions:

1. Are the findings of an antecedent analysis of descriptive observations at home predictive of the results of a functional analysis at home?

2. Are the findings of an antecedent analysis of descriptive observations at school predictive of the results of a functional analysis at school?

CHAPTER 2
REVIEW OF THE LITERATURE

Overview

Children with Autism Spectrum Disorder (ASD) commonly display problematic behaviors severe enough to interfere with learning (Charlop et al., 1993). Frequently reported problem behaviors include self-injurious behaviors (e.g., head hitting or head banging), stereotypic behaviors (e.g., rocking, hand flapping), and disruptive behaviors (e.g., tantrums, aggressions) (Charlop et al., 1993). Such problem behavior is a primary cause of exclusion from general education classrooms for many children with developmental disabilities including children with ASD (Charlop et al., 1993; Reichle, 1997). Therefore, an ongoing and critical challenge for educators is to find effective interventions aimed at decreasing problematic behavior in the classroom in order to serve these children in the least restrictive setting.

One of the most effective and empirically supported models for designing effective interventions stems from the work of applied behavior analysis (ABA) (Charlop et al., 1993). Applied behavior analysts systematically alter the child's environment through the utilization of basic behavioral principles (e.g., positive reinforcement, negative reinforcement) in order to reduce behavioral excesses and increase adaptive behaviors.

ABA methods refined over the past 20 years have advanced the methodology available to better manage classroom behavior problems. Developments in ABA suggest that pre-intervention assessment is critical for designing maximally effective interventions (Lennox & Miltenberger, 1989). In addition, pre-intervention assessments should be aimed at examining the function, or variables controlling problem behavior (Mace, 1994).

The following literature review summarizes and analyzes the relevant ABA research regarding assessment and intervention related to reducing problem behaviors for persons with developmental disabilities and ASD. Additionally, the relationship between functional (experimental) analysis and descriptive (correlational) analysis is discussed. The chapter is organized into the following sections: variables controlling problem behavior, identifying maintaining variables, linking descriptive assessments and functional analyses, research comparing descriptive and functional analyses, designing interventions based on controlling variables, and implications of related research.

Variables Controlling Problem Behavior

A critical area in the research on problem behaviors involves uncovering the factors motivating individuals to engage in problem behavior (Carr, 1977). Understanding why problem behavior occurs is an important step toward designing effective interventions (Carr, 1977). In 1977, Carr reviewed the literature on motivational factors contributing to self-injurious behavior, a common problem behavior for persons with developmental disabilities and ASD. In the review, Carr described several theories on the cause of self-injury. The theories he outlined included (a) self-injury occurs because of operant conditioning (e.g., positive or negative reinforcement) (b) self-injury is organic in nature and is the product of aberrant physiological processes, and (c) self-injury is a psychodynamic process aimed at reducing guilt. At the time of the review, the only theory supported by literature was that operant conditioning plays a role in the occurrence of self-injury. More specifically, the literature suggested that positive reinforcement (i.e., the production of a stimulus following the behavior), negative reinforcement (i.e., the removal of a stimulus following the behavior), and automatic reinforcement (i.e., sensory stimulation produced by the behavior) might all play a role in the occurrence of self-injury.

Many researchers now agree that problem behavior is affected by operant conditioning (Iwata et al., 1982/1994; Horner and Carr, 1997). In general, researchers have identified two main categories of controlling variables that contribute to the operant conditioning of problem behavior. These controlling variables have been categorized as consequences (events that happen subsequent to problem behavior), and antecedents (events that happen prior to or concurrent with problem behavior).

Consequences as Controlling Variables

Consequences, or events that occur subsequent to problem behavior may serve as reinforcers, thereby strengthening problem behavior. In general, applied behavior analysts have identified three categories of reinforcers that may be maintaining problem behavior (Carr, 1977; Iwata et al. 1982/1994). These reinforcers include (a) positive reinforcement, (b) negative reinforcement and, (c) automatic reinforcement (Lalli & Goh, 1993).

Positive reinforcement

Research on the role of consequences associated with problem behavior has identified several instances where problem behavior is maintained by positive reinforcement (Fisher, Ninness, Piazza, & Owen-DeSchryver, 1996; Mace & Lalli, 1991;

Ringdahl, Vollmer, Marcus, & Roane, 1997). For example, in some instances adult social attention served as a reinforcer. In other words, problem behavior consistently served to obtain adult attention (Fisher et al., 1996). Fisher et al. examined the reinforcing effects of attention on various forms of problem behavior (aggression, property destruction) for a 4-year old male with developmental disabilities. Using a multi-element design, researchers compared the rates of problem behavior when either reprimands (e.g., "Don't hit me") or unrelated verbal statements (e.g., "It's sunny outside") were provided contingent on problem behavior. Results showed that rates of problem behavior were higher in the reprimand condition than in the unrelated verbal statement condition. The results of this study suggested that reprimands served as a positive reinforcer for problem behavior for this child.

Other researchers have found that tangible items (e.g., toys, food) may also serve as positive reinforcers for problem behaviors, meaning that problem behavior may occur as a means of gaining access to preferred items such as toys, food or activities/materials (Horner & Carr, 1997; Sasso et al., 1992; Vollmer, Marcus, Ringdahl, & Roane, 1995).

Negative reinforcement

In other instances, problem behaviors may be maintained by negative reinforcement; or by avoiding or escaping difficult or nonpreferred activities (Hall et al., 1997; Mace & Belfiore, 1990; Taylor, Ekdahl, Romanczyk, & Miller, 1994). For example, Taylor et al. examined the role of negative reinforcement for four children exhibiting problem behaviors during academic tasks. In this study participants were instructed to complete academic tasks under two conditions (high and low interaction). In the high interaction condition, an adult interacted with the participant every 10 seconds using an enthusiastic tone of voice, animated facial expressions, and leaned towards the participant in a friendly manner. In the low interaction condition, an adult interacted with the participant every 10 seconds using a neutral tone of voice and neutral facial expressions. Additionally, participants were exposed to play conditions with either high or low interaction. For two of the children, problem behavior was higher during task situations than during the play situations regardless of the quality of interaction. These results suggested that for two children, problem behavior was associated with task avoidance, or negative reinforcement. For the other two participants, there was no differentiation in occurrence of problem behavior between task and play situations, suggesting that problem behavior was not motivated by task avoidance. However, further analysis revealed that problem behaviors occurred more frequently following adult requests and social statements, and less frequently following no adult interaction. Based on these results, the researchers suggest that for the latter two participants, problem behavior may be maintained by social avoidance, or negative reinforcement in the form of avoiding attention.

Automatic reinforcement

Finally, problem behavior may be maintained by unidentified sensory reinforcers, termed automatic reinforcement. For example, problem behaviors such as self-injury, pica, and stereotypy may occur in the absence of identifiable positive or negative reinforcers (Freeman et al., 2000; Shore, Iwata, DeLeon, Kahng, & Smith, 1997). Such behaviors may be maintained by sensory reinforcers (e.g., visual, auditory, or tactile reinforcement) automatically produced by the behavior (Horner & Carr, 1997).

For example, Shore et al. (1997) examined the relationship between environmental variables and problematic behaviors for 3 adults with profound mental retardation. Participants were exposed to four experimental conditions: an attention condition, where attention was delivered contingent on problem behavior; a demand condition, where escape from demands was provided contingent on problem behavior; an alone condition, where the participant was left alone without any adult interaction; and a play condition, where the participant was permitted to play with preferred items as well as interact with an adult. For all four participants, problem behavior occurred during all four conditions. The results suggested that problem behavior was not maintained by social consequences (positive or negative reinforcement). Instead, researchers concluded that some unidentified automatic reinforcer maintained problem behavior.

Antecedents as Controlling Variables

A second class of controlling variables is antecedents. Antecedent events, also described as a fourth term contingency, occur prior to or concurrent with the problem behavior. These events function differently than consequences in that antecedents set the occasion for problem behavior to occur, whereas consequences maintain problem behavior. Antecedents, or fourth term contingencies have been referred to as establishing operations (Michael, 1982), as well as setting events (Kantor, 1970). However, in each case, the occurrence of the fourth term alters the probability that a behavior will occur. . For example, food deprivation functions as fourth term, making food a more powerful reinforcer and altering the probability that food seeking behavior will occur.

Research on the functional relationships of problem behavior and the environment has identified occasions when altering antecedent events affect the occurrence of problem behavior. For example, Carr and Durand (1985) showed that manipulating antecedent events was effective in altering the rate of problem behavior for four children with developmental disabilities. In this study, children ranging in age from 7 to 14 years were exposed to academic tasks of varying difficulty level (easy and difficult) and with varying amounts of adult attention (100% of the time versus 33% of the time). Under these varying task conditions, differential responding was observed for each of the four participants. For two of the participants, problem behaviors occurred most frequently when the task was difficult and attention was provided 100% of the time. For one of the participants, problem behaviors occurred most frequently when adult attention was limited to 33% of the session. For the fourth participant, problem behavior occurred most frequently when the task was difficult and when adult attention was restricted. Results of this study demonstrated differential rates of problem behaviors as a result of antecedent manipulations.

In another study, Ringdahl et al. (1997), manipulated antecedent events in order to reduce the stereotypic and self-injurious behavior for three children with developmental disabilities. In this study, preferred tangible items were identified and provided for each participant. Researchers found that fewer problem behaviors occurred in the enriched environment (when preferred items were available), whereas a greater number of problem behaviors occurred when preferred items were unavailable. Again, the results of this study suggested that the manipulation of antecedent events, in the form of access to preferred items, may serve as controlling variables for problem behavior.

Research suggests that both antecedents and consequences affect the occurrence of problem behavior. Consequences control the occurrence of problem behavior through positive, negative, and automatic reinforcement. Antecedents set the occasion for problem behavior to occur by altering the effectiveness of the reinforcer that follows (establishing operations) or interrupting the stimulus-response relationship (setting events). Applied behavior analysts emphasize the role of controlling variables when designing interventions aimed at reducing problem behavior. Therefore, a critical part of applied behavior analysis involves the accurate identification of the variables controlling problem behavior.

Identifying Maintaining Variables

Applied behavior analysts agree that identifying the variables maintaining problem behavior is critical to designing effective interventions (Lennox & Milenberger, 1989; Iwata 1994). However, there is less agreement regarding the specific methods that should be used to identify maintaining variables. Methods used to identify the function of problem behavior have varied considerably (Mace & Lalli, 1991). Functional assessment is a broad term representing assessment procedures designed to determine the variables controlling and maintaining problem behavior (Horner, 2000). Several types of functional assessment techniques exist. The two most commonly used techniques are descriptive and experimental assessments. Descriptive assessments examine the environment-behavioral interactions occurring in the natural environment. Experimental techniques involve direct manipulation of antecedents and/or consequences. The purpose of the following section is to describe the most commonly used functional assessments techniques, as well as to identify the strengths and limitations of each technique.

Descriptive Assessments

Descriptive assessments are used to evaluate patterns of environment-behavior interactions in order to develop hypotheses about the variables maintaining functional relationships. Some descriptive techniques use indirect measures of behavior (e.g., interviews, rating scales), and others rely on direct measures (e.g., naturalistic observations). During indirect assessments, the behavior is not directly observed. Typically, indirect assessments involve the use of anecdotal reports such as behavior rating scales or interviews completed by primary caregivers (Shapiro & Kratochwill, 2000). During direct assessments, direct observations of behavior are conducted (Shapiro & Kratochwill, 2000).

In general, descriptive assessments often provide information such as (a) physical description of the problem behavior, (b) the frequency and duration of the problem behavior (c) possible circumstances that co-occur with the problem behavior, and (d) events that typically follow the problem behavior (Horner & Carr, 1997). However, information generated from descriptive assessments is not experimentally based. Therefore, descriptive assessments reveal only correlations between behavior patterns and environmental events.

Indirect measures

Indirect descriptive measures typically involve structured checklists or interviews with primary caregivers, teachers, or other informants in order to obtain anecdotal information about the behavior-environment interactions. Rating scales, checklists, and other questionnaires provide a structured set of questions that help in the formulation of the hypothesis of the function of behavior. For example, the Motivation

Assessment Scale is a rating scale used to identify potential consequences controlling problem behavior (Durand & Crimmins, 1988). Specifically, the MAS includes 16 questions to assess four controlling variables (attention, tangible items, escape, and automatic reinforcement). Results are summarized by averaging the point values for groups of questions pertaining to some function, and it is assumed that the highest category total reflects the function of the target behavior.

A second method of indirect assessment involves behavioral interviews. Behavioral interviews involve asking primary caregivers, teachers, or other informants about the problematic behavior as well as the variables associated with the behavior. Interviews often include questions regarding the antecedents and consequences surrounding the behavior. One example of a behavior interview is The Functional Analysis Interview (O'Neill, Horner, Albin, Sprague, & Storey, 1997). The FAI is an 11-part instrument containing sections on topographical descriptions of problem behavior, setting events that may influence problem behavior (medical conditions, diet, schedule, staffing patterns), antecedents and consequences surrounding the behavior, communication skills, reinforcers, and history of treatment.

Indirect assessment measures are useful for several reasons. First, in comparison to direct measures, they do not require much time on the part of the examiner or examinee. Therefore, important information regarding the problem behavior can be generated quickly from a wide variety of informants. Second, most indirect measures are easy to administer, requiring little expertise on the part of the examiner. Therefore, it is possible to have many school personnel conducting these types of functional assessments.

Despite the benefits of indirect measures, several limitations exist. First, research has found that indirect measures are often unreliable and results are not replicable (Chait, 2001; Sturmey, 1994; Zarcone et al., 1991). Second, the information generated from indirect measures is subjective rather than objective. Indirect measures rely on the memory and perceptions of the informants rather than on actual environment-behavior interactions (Horner & Carr, 1997). Therefore, it is typically recommended that indirect measures serve as a starting point in the functional assessment process (Lennox & Miltenberger, 1989).

Direct assessments

A second method of descriptive assessments involves direct assessment. Direct assessment, an approach first described by Bijou et al. (1968), allows for the observation and analysis of behavior-environment interactions occurring in the natural environment. In general, occurrences of target behavior are recorded in relationship to events that precede (antecedents) and follow (consequences). The basic assumption when conducting direct assessments is that correlational relationships between environmental events and target behavior are suggestive of possible functional relationships. For example, if an observed problem behavior is commonly followed by the removal of demands, then the function of the behavior may be to escape tasks. Bijou et al. described a direct assessment method that involves continuous observation and recording of behavior and environmental events. Other direct assessment methods include ABC (antecedent-behavior-consequence) narratives, where data is collected only when the behavior is observed (O'Neill et al., 1997).

Based on the work of Bijou et al. (1968), direct assessments often involve continuous observation and recording of behavior either as frequency, interval, or time-sampling procedures. For example, Mace and Belfiore (1990) conducted a descriptive assessment of a woman's stereotypic behavior. Using a 10-second partial interval recording system, researchers recorded the occurrence of stereotypy as well as several categories of antecedents and consequences. In this study, conditional probabilities were calculated in order to identify the consequences and antecedent occurring most frequently with the problem behavior. Calculating the conditional probabilities involved (a) dividing the number of intervals scored with target behavior by the number of intervals with a given antecedent, and (b) dividing the number of intervals scored with target behavior by the number of intervals with a given consequence. Results of this analysis indicated that social interactions were the most frequently occurring antecedents, and the most frequent consequences were disapproval and continued instruction. These data suggested that in this case stereotypy was possibly maintained by positive reinforcement in the form of social attention.

In a similar type of direct assessment, ABC assessment, the observer collects information on naturally occurring environment-behavior interactions. However, in ABC assessment, data is only collected when the behavior occurs, and not continuously through time. In ABC assessments, the observer records the occurrence of the target behavior as well as the antecedents and consequences directly surrounding the target behavior. One example of a modified ABC assessment is the Functional Assessment Observation Form (O'Neill et al., 1997). The FAO is a structured observation system that is completed while directly observing an individual. On the FAO, information is recorded about the target behavior observed, antecedent events occurring prior to the target behavior, perceived functions of the problem behavior, and consequences occurring after the problem behavior is observed. Information from ABC analyses reveals the sequence of behaviors and their environmental correlates and is useful in identifying potential behavioral functions (Lerman & Iwata, 1993).

In general, researchers support the use of direct measures over indirect measures because direct measures provide a more objective, accurate indication of the naturally occurring behavior-environment interaction (Bijou et al., 1968). In addition, the correlations between antecedents, behaviors, and consequences identified in naturalistic observations provide a systematic basis for formulating hypotheses about the variables controlling problem behavior (Hall et al., 1997). When there is a high correlation between specific environmental events and the behavior of interest, inferences about controlling variables for problem behavior can be formulated (Lerman & Iwata, 1993; Mace & Lalli, 1991). In addition, when information is obtained from naturally occurring events, the identification of variables effecting behavior can be determined more systematically.

Despite the utility of direct assessments, several limitations exist. First, several direct assessments are plagued with practical constraints, such as complicated data analysis. Analyzing direct assessment data can involve the calculation of complex condition probabilities, which can be relatively time consuming. In addition, collecting direct assessment data may require lengthy observations. For example, Bijou et al. (1968) conducted 3.5 hours of observations over a period of 28 days, which is a considerable amount of time to allocate to pre-assessment data. According to Lalli and Goh (1993) applied behavior analysts have failed to embrace descriptive assessments because of the

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practical constraints involved in conducting these analyses. A second limitation of direct assessments is that the results are only suggestive of functional relationships (Mace & Lalli, 1991; Hall et al., 1997). Because there is no direct manipulation of variables in descriptive assessments, they may fail to identify the variables controlling problem behavior (Lerman & Iwata, 1993). Experimental analyses address this limitation and are described in detail next.

Functional Analysis

Descriptive assessments document naturally occurring environment-behavioral interactions. Direct manipulation of the variables hypothesized to control problem behavior is needed in order to identify functional relationships. Experimental techniques directly manipulate antecedents and/or consequences. Suspected controlling variables are manipulated using experimental methodology in order to demonstrate functional relationships.

Functional analysis is an experimental method used to identify functional relationships between environmental variables and problem behavior. Functional analysis involves direct manipulation of consequence events. The goal is to isolate and identify the factors responsible for the occurrence of problem behavior (Mace et al., 1991).

Iwata et al. (1982/1994), developed the first methodology to identify the function of problem behavior. Iwata et al. exposed 9 adults with severe to profound mental retardation to four analog conditions. The conditions consisted of (a) contingent social disapproval where self-injury was followed by attention in the form of a statement of disapproval, (b) contingent escape, where self-injury was followed by withdrawal of demands, (c) an alone condition, where the client was alone in a room with no stimulation, and (d) a play condition, where no demands, and frequent attention was provided. The functional analysis conditions were designed to identify specific variables maintaining problem behavior. The attention condition was used to test the role of positive reinforcement. The escape condition was used to test the role of negative reinforcement. The alone condition was used to test the role of automatic reinforcement, and the play condition served as a control. After repeated observations in each of these four conditions, using a multi-element design, Iwata and colleagues were able to identify the conditions associated with the highest occurrence of self-injury. For example, two of the nine participants consistently exhibited the highest rates of self-injury in the escape condition. Therefore, researchers concluded that escape from tasks was most likely maintaining problem behavior for these two individuals.

In addition to the four conditions described by Iwata et al. (1982/1994), other researchers have incorporated an additional condition, where access to preferred tangible items is made contingent on problem behavior (Vollmer et al., 1995). For example, Vollmer et al. incorporated a tangible condition for children whose parents reported problem behavior in relation to the removal of tangible items.

The most significant advantage of using a functional analysis is that functional relationships among hypothesized maintaining variables and problem behaviors are directly tested (Sasso et al., 1992; Mace, 1994). This differs from descriptive assessments that provide only correlational information.

Despite the benefits of a functional analysis, several potential limitations exist. Several researchers have suggested that the optimum control provided in the experimental analog setting may be problematic (Day, Horner, & O'Neill, 1994; Lerman

& Iwata, 1993; Sasso et al., 1992). Analog refers to simulation of the natural environment in a controlled "artificial" setting. Critics argue that consequences delivered in experimental conditions may not be identical to those maintaining the behavior in the natural environment (Lerman & Iwata, 1993; Sasso et al., 1992). Therefore, researchers conducting experimental analyses may overlook important variables operating in the natural setting, and hence, the results may not generalize outside the analog setting (Mace, 1994).

An additional problem with experimental analysis is that practical limitations sometimes preclude its use in certain situations (Sasso et al., 1992). For example, limitations in staff, time, or facilities may limit the ability to conduct experimental analyses (Lennox & Miltenberger, 1989). In addition, experimental analyses may require some degree of expertise and may limit its use to only those with training (Sasso et al., 1992).

Reasons for Combining Descriptive and Experimental Analyses

According to Bijou et al. (1968) psychology, as a science, depends on both descriptive and experimental analyses. Descriptive assessments provide information explaining how behavior and the environment interact, whereas experimental analyses provide information regarding why behavior occurs (Bijou et al., 1968).

Mace and Lalli (1991) argue that not only is it important to conduct descriptive and experimental analysis, but that there are certain advantages to combining their use when evaluating functional relationships between problem behavior and environmental events. Combining descriptive and experimental analyses may improve the validity of functional analysis (Mace & Lalli, 1991). Presumably, the findings of a functional analysis would have greater validity if the problem behavior and the identified maintaining variables were observed to co-occur in the natural environment (Mace et al., 1991). Therefore, one purpose of descriptive assessment is to provide a basis for the formulation of hypotheses of possible functional relationships between problem behavior and environmental events (Mace et al., 1991).

Additionally, descriptive measures have become a useful tool in determining how to conduct functional analysis conditions. Based on descriptive data, researchers are able to match natural conditions (e.g., type of demand) (Mace & Lalli, 1991) when conducting experimental sessions. Overall, descriptive assessment may include information about idiosyncratic variables related to problem behaviors such as the presence or absence of a specific person, a specific instructional technique (physical prompts), a particular form of instructional demand (finish your work), or repeated demands (Mace, 1994).

Researchers have suggested that descriptive and experimental analyses could be combined in order improve the accuracy and validity in identifying the environmental events contributing to problem behavior (Bijou et al., 1968; Mace et al., 1991).

Research Comparing Descriptive and Experimental Analyses

Several researchers have conducted studies utilizing both direct descriptive assessment and experimental analyses. The purpose of this section is to review the empirical literature combining the use of descriptive and functional analyses. Studies were included in this review if (a) an assessment was conducted in order to identify the function of problem behavior, (b) a descriptive assessment was conducted that involved naturalistic observations consistent with the procedure described by Bijou et al. (1968) and, (c) an experimental, functional analysis based on the procedure outlined by Iwata et al. (1982/1994) was conducted. In addition, all identified studies had to be available through the University of Florida library or inter-library loan system. The sources of the literature reviewed included the Education Resource Information Center (ERIC), and PsychLit.

Seven studies were identified which combined experimental and descriptive assessments in order to identify the function of problem behavior (see Table 2-1) (Belfiore et al., 1993; Freeman et al., 2000; Hall et al., 1997; Lalli, Browder, Mace, & Brown, 1993; Lerman & Iwata, 1993; Mace & Lalli, 1991; Sasso et al., 1992). In general, the purpose of these studies was (a) to determine the extent to which the results of a descriptive assessment were congruent with the results found in an experimental functional analysis, and (b) to identify how descriptive and experimental assessments can be combined to facilitate the identification of variables maintaining problem behavior. The description of the research is divided into 3 sections; the first summarizing the research, the second summarizing the extent to which descriptive and experimental findings were congruent, and the third summarizing similarities and differences in methodologies that may be related to the validity of results in the descriptive assessment.

Summary of Research Combining Descriptive and Functional Analyses

In a study by Mace and Lalli (1991) independent descriptive and functional analyses were conducted in order to identify the function of bizarre speech for a 46-year old male with mental retardation. Descriptive assessment data was collected on naturally occurring antecedent events, bizarre speech, and naturally occurring consequence events. Table 2-2 shows the categories of antecedent and consequence events scored for each descriptive assessment. Table 2-3 displays the conditional probabilities that were calculated in order descriptive assessment. Table 2-3 displays the conditional probabilities that were calculated in order to analyze the descriptive data. Results of this analysis revealed that (a) bizarre speech occurred most often during task demands and in the absence of adult attention, and (b) bizarre speech was most frequently followed by task disengagement (e.g., stopped doing the task). Based on these results, researchers hypothesized that bizarre speech was maintained by both escape and attention. The results of a functional analysis conducted on bizarre speech identified only attention as a maintaining variable. In this case, the descriptive assessment was useful in identifying the variable maintaining problem behavior. However, the descriptive assessment identified an additional controlling variable (escape from tasks) that was not confirmed by the functional analysis.

Despite these differences, Mace and Lalli (1991) support the use of both descriptive assessments and functional analyses. Using a descriptive assessment narrowed the scope of plausible hypotheses, thus eliminating the need to run all experimental conditions in a functional analysis. In addition, the results of the descriptive assessment were useful in designing the conditions of the functional analysis. The observations in the descriptive assessments indicated (a) the type of demand that the participant normally encountered, (b) the common forms of attention and escape that accompanied bizarre speech, and (c) an estimate of the schedule for escape and attention. Several researchers have used methods similar to Mace and Lalli (1991) to compare the results of descriptive and functional analyses (Belfiore et al., 1993; Hall et al., 1997; Lalli et al.,1993). Lalli et al. conducted a study using both descriptive and functional analyses

Table 2-1: Research Combining Descriptive Assessment and Functional Analysis in Order to Identify the Function of Problem Behavior

Authors	Participants	Target Behaviors	Descriptive Assessment Function	Functional Analysis Function	Are the DA and FA congruent?
Mace & Lalli (1991)	46-year-old male with mental retardation	Bizarre Speech	Attention Escape	Attention	1 congruent 1 incongruent
Sasso et al. (1992)	7.5-yr-old female with autism	Aggression Inappropriate vocalizations	Escape	Escape	congruent
	13-yr-old male with autism	Aggressions	Tangible Escape	Tangible Escape	congruent
Belfiore et al. (1993)	58-yr-old male with severe mental retardation	Self-injury (biting)	Escape	Escape	congruent
Lalli et al. (1993)	10-yr-old male with cerebral palsy	Self-injury (head banging)	Attention	Attention	congruent
	10-yr-old male with Down Syndrome	Aggression	Attention	Attention	congruent
	14-yr-old female with cerebral palsy	Self-injury (head scratching)	Attention Escape	Escape	1 congruent 1 incongruent

Table 2-1: Continued

Authors	Participants	Target Behaviors	Descriptive Assessment Function	Functional Analysis Function	Are the DA and FA congruent?
Lerman & Iwata (1993)	3 males and 3 females with profound mental retardation (ages 27-43)	Participant 1- Self-injury (head banging), hand biting	Attention Escape	Escape	1 congruent 1 incongruent
		Participant 2 – Self-injury (hand mouthing)	Attention Escape	Attention	1 congruent 1 incongruent
			Automatic	Automatic	congruent
		Participant 3 – Self-injury (hand mouthing)	Attention Escape	Escape	1 congruent 1 incongruent
		Participant 4 – Self-Injury (head hitting)	Attention	Escape	incongruent
		Participant 5 – Self-injury (head banging, head hitting and body hitting	Undifferentiated	Escape	incongruent
		Participant 6 – Self-injury (head hitting and hand biting)			

Table 2-1: Continued

Authors	Participants	Target Behaviors	Descriptive Assessment Function	Functional Analysis Function	Are the DA and FA congruent?
Hall et al. (1997)	9-yr-old male with Down syndrome	Aggression Destruction	Escape Attention	Escape	1 congruent 1 incongruent
Freeman et al. (2000)	8-yr-old female with moderate to severe mental retardation	Aggression Destruction	Escape Attention	Escape Attention	congruent
	10-yr-old male with profound mental retardation	Self-injury (head banging Aggression Destruction	Automatic	Automatic	congruent

to identify the function of aggression and self-injury for three children with severe or profound mental retardation. Using a 10-second partial interval recording system, researchers recorded problem behavior, antecedent events, and consequence events. Conditional probabilities were calculated using the formulas described in Mace and Lalli. For one participant, problem behavior occurred most frequently during task demands, and was followed most frequently by the interruption of the tasks. Researchers hypothesized an escape function for this participant. A subsequent functional analysis identified both escape and attention as controlling variables. For the second participant, problem behavior occurred most frequently during play situations without one to one attention, and problem behavior was most frequently followed by attention. Attention was identified as the hypothesized function for this participant. A functional analysis of problem behavior also identified attention as a function. Finally, a third participant was observed to exhibit problem behavior most frequently during group instruction and during play situations without one to one attention. In addition, problem behaviors were most frequently followed by adult attention. For this participant, researchers hypothesized attention as the function of problem behavior. A functional analysis also identified attention as the controlling variable. In this case, the descriptive assessment was useful in identifying the variable maintaining problem behavior for two of the participants. However, for a third participant, the descriptive assessment identified one maintaining variable (escape), whereas the functional analysis identified two maintaining variables (escape and attention).

Table 2-2: Categories of Antecedent Subsequent Events Scored for the Descriptive Assessments and the Conditions of the Functional Analyses

Studies	Descriptive assessment		Functional Analysis
	Antecedent Events	Consequence Events	Conditions
Mace & Lalli (1991)	Interaction No interaction Task present Alone	Social disapproval Positive interaction Tangible delivery Task disengagement	Attention Interaction/no demand Escape Escape with social disapproval
Sasso et al. (1991)	Free Play Low Demand/High Attention High Demand/High Attention Low Demand/Low Attention	Escape Tangible Ignore	Alone or Ignore Attention Escape Tangible Play
Belfiore et al. (1993)	Required Activity Interaction No activity/No interaction	No response Interaction Tangible Reinforcement Activity Attenuation	Escape (old activity) Escape (novel activity) Interaction No activity/no interaction
Lalli et al. (1993)	Task (one-on-one) Task (group) Play (one-on-one)	Attention Tangible Escape	Attention Escape

Table 2-2: Continued

Studies	Descriptive assessment		Functional Analysis
	Antecedent Events	Consequence Events	Conditions
Lerman & Iwata (1993)	Attention delivery Interaction with Subject Direction Ongoing instruction Attention removal Instruction Removal Materials present Staff member in Room Ambient stimuli	Attention delivery Interaction with subject Direction Ongoing instruction Attention removal Instruction removal	Attention Escape Alone Play
Hall et al. (1997)	Instruction High Interaction Low Interaction	Attention/Reprimand Attenuated Task Ignore Tangible Delivery with Attention	Escape (Constant Instruction) Escape (Varied instruction) Interaction/ Reprimand
Freeman et al. (2000)	Attention Escape Tangible Control	None	Attention Escape Tangible Play

Table 2-3: Conditional Probabilities for the Descriptive Assessments

Studies	Analysis	Explanation	Formulas
Mace & Lalli, 1991; Lalli et al. (1993)	Antecedent	Probability of target behavior following a given antecedent event.	$\frac{\text{Intervals containing target behavior and an antecedent event}}{\text{Intervals containing antecedent event}}$
	Consequence	Distribution of consequence events given the occurrence of target behavior during a given antecedent.	$\frac{\text{Intervals containing target behavior and antecedent event that were followed by consequence event}}{\text{Intervals containing target behavior and antecedent event}}$
Belfiore et al. (1993); Hall et al. (1997)	Antecedent	Probability of target behavior following a given antecedent event.	$\frac{\text{Intervals containing target behavior and an antecedent event}}{\text{Intervals containing antecedent event}}$
	Consequence	Probability of consequence events following the target behavior	$\frac{\text{Intervals containing target behavior and antecedent event that were followed by consequence event}}{\text{Intervals containing target behavior}}$

Table 2-3: Continued

Studies	Analysis	Explanation	Formulas
Lerman & Iwata (1993)	Antecedent	Proportion of problem behavior following each antecedent event.	a) $\frac{\text{Intervals containing SIB that followed an antecedent event}}{\text{Intervals scored with SIB}}$ b) $\frac{\text{Intervals containing an antecedent event that preceded SIB}}{\text{Intervals scored with the event}}$
	Consequence	Proportion of problem behavior followed by each consequence event.	a) $\frac{\text{Intervals containing SIB that preceded a consequence event}}{\text{Intervals scored with SIB}}$ b) $\frac{\text{Intervals containing a consequence event that followed SIB}}{\text{Intervals scored with the event}}$
	Concurrent event	Proportion of problem behavior occurring concurrent with other environmental events	a) $\frac{\text{Intervals containing both SIB and a concurrent event}}{\text{Intervals scored with SIB}}$ b) $\frac{\text{Intervals containing both SIB and concurrent event}}{\text{Intervals scored with the event}}$

Belfiore et. al. (1993) conducted a study to identify the function of self-injury for a 58 year-old male with severe mental retardation. A 10-second partial interval recording system was used to collect data on self-injury, antecedent events, and consequence events. Again, conditional probabilities, similar to those used by Mace and Lalli (1991) were calculated in order to analyze the results. An analysis of antecedent and consequence events revealed that problem behavior occurred most frequently during required tasks, and was followed most frequently by no response. Based on these results researchers hypothesized an escape function for self-injury. A functional analysis conducted on self-injury also identified an escape function. In this case, the results from the descriptive assessment matched those in the functional analysis.

Hall et al. (1997) examined the function of aggressive and destructive behavior in a 9-year-old boy with Down syndrome. Using a data collection and analysis procedure similar to Mace and Lalli (1991), problem behavior was observed most frequently during task demands, and was followed most frequently by attention. Consequently, researchers hypothesized both attention and escape as the functions of problem behavior. A subsequent functional analysis on aggressive and destructive behavior identified only an escape function. In this case, the descriptive assessment was useful in identifying the variable maintaining problem behavior. However, the descriptive assessment identified an additional controlling variable (attention) that was not confirmed by the functional analysis.

Lerman and Iwata (1993) conducted a study comparing the results of descriptive and functional analyses for six adults with developmental disabilities who engaged in self-injury. The methods used to collect descriptive data were similar to those used by

Mace and Lalli (1991). However, Lerman and Iwata utilized slightly different methods to analyze the data. Lerman and Iwata generated six conditional probabilities to examine the relationship between problem behavior, antecedent events, and consequence events. Table 2-3 reveals the formulas used to analyze data generated from their descriptive assessments. Despite the in-depth analysis of the descriptive data, Lerman and Iwata found inconsistent results between descriptive and functional analyses. Overall, the descriptive assessments were useful in identifying the extent to which self-injurious behavior was related to social versus automatic reinforcers. However, the descriptive assessments were insufficient to differentiate between positive reinforcement (attention or tangible) and negative reinforcement (escape).

Using a slightly different method of collecting descriptive observations, Sasso et al. (1992) and Freeman et al. (2000) conducted independent functional and descriptive assessments. In both studies, researchers set up situations similar to conditions used in a functional analysis. For example in the Sasso et al. study, children were observed during activities that were solitary (e.g., free play), low in demand and high in teacher attention (e.g., morning play with teacher), high in task demands, or low in demands and teacher attention. In the Freeman et al. study, children were observed during structured sessions when adult attention was diverted (attention condition), during task demands (escape condition), when preferred activities were removed (tangible condition) and during play sessions (control). This method of data collection allowed for a comparison of the rate of problem behavior in each of the antecedent conditions.

Sasso et al. (1992) examined the function of aggressive behaviors and inappropriate language of a 7-year-old female and 13-year-old male with autism. For the first participant, results of the descriptive assessment revealed that problem behavior occurred most frequently during tasks. Based on this finding researchers hypothesized an escape function. A functional analysis also identified an escape function. For the second participant, problem behaviors were observed most frequently during tasks, and when tangibles were restricted. Based on these results researchers hypothesized a tangible and escape function. A subsequent functional analysis also identified escape and tangible functions.

Freeman et al. (2000) examined the function of problem behavior of an 8-year-old female and a 10-year-old male with mental retardation. For the first participant, during descriptive observations, problem behavior was observed most frequently when attention and tangible items were restricted. For this participant, both attention and tangible items were hypothesized as the function of problem behavior. A functional analysis also identified tangible and attention as functions of problem behavior. For the second participant, the descriptive assessment did not reveal differential responding across conditions. A functional analysis also revealed an undifferentiated function.

In both the Freeman et al. (2000) and the Sasso et al. (1992) studies, results from the descriptive assessments were consistent with findings in the functional analyses. According to Sasso et al. (1992), this type of structured descriptive technique may be useful as an alternative to experimental functional analyses when teachers are unable to conduct a functional analysis.

Comparing the Results of Descriptive and Functional Analyses

One of the main goals of studies designed to link descriptive and functional analyses is determining the extent to which findings in the descriptive assessment match those in the functional analysis. A review of these studies reveals mixed results. Three of the seven studies reviewed found that descriptive assessments were effective at predicting results from functional analyses (Belfiore et al., 1993; Freeman et al., 2000; Sasso et al., 1992). In both the experimental and descriptive assessments, Sasso et al. identified escape as the function for one participant and multiple functions (escape and tangible) for the second participant, Freeman et al. identified social positive reinforcement function for one participant and found undifferentiated results for the second participant, and Belfiore et al. identified an escape function.

Two of the seven studies found that descriptive measures were effective in predicting the function of problem behavior for some of the participants, but were incongruent for other participants (Lerman & Iwata 1993, 1992; Lalli et al., 1993). For example, two of the three participants in the Lalli et al. study were identified as having attention functions in both the descriptive and functional analyses. However, for the third participant, the descriptive assessment identified escape and attention as possible hypotheses, whereas the functional analysis only identified escape as a function. Lerman and Iwata also found inconsistent results across participants. For all six participants, the descriptive assessment was congruent with the functional analysis in differentiating between social and automatic reinforcers. However, for participants whose problem behaviors were socially maintained, the descriptive assessment was unable to differentiate between positive reinforcement (attention) and negative reinforcement (escape) functions.

Two of the seven studies found the results of the descriptive assessment to be incongruent with those of a functional analysis (Hall et al., 1997; Mace & Lalli, 1991). In both cases the descriptive assessments identified attention and escape as possible functions, whereas the functional analysis identified only escape as a function.

Overall, current methods of descriptive assessment have been somewhat limited in their ability to identify the function of problem behavior determined through functional analyses. In particular, the current methods of naturalistic observation are successful in differentiating automatic from socially maintained behaviors. However, there is a tendency for descriptive measures to identify social reinforcers that are not substantiated in subsequent functional analyses.

Research on comparing descriptive and functional analysis have not strayed far from Mace and Lalli (1991) procedures for collecting and analyzing the data. In other words, descriptive assessments tend to rely on an analysis of both antecedent and consequences in identifying hypothesized function. To date, no researchers have attempted to isolate the relative importance of antecedent or consequence events in identifying function. It appears there is a need to identify an alternative methodology in order to increase the congruence between descriptive and functional analysis. This study will attempt to identify the importance of antecedent events in descriptive assessment methodology.

Alternative Methods

One possible reason for the inconsistent congruence between experimental and descriptive assessments may be due to the different methods of collecting and analyzing descriptive data. Data collection methods for naturalistic observations differ among researchers.

One factor that differed between the studies was the methods used to analyze the data from the descriptive assessments. Most researchers examined both antecedent and consequence events occurring in relation to the problem behavior (Belfiore et al., 1993; Hall et al., 1997; Lalli et al., 1993; Lerman & Iwata, 1993; Mace & Lalli, 1991). For example, Belfiore et al. hypothesized that problem behavior for an adult male was maintained by escape because (a) the antecedent event task demands most often preceded the problem behavior, and (b) the consequence no interaction most commonly followed problem behavior. In other words, hypotheses were based on an analysis of both antecedent and consequence events but experimental analyses were conducted only on consequence events. Other researchers interpreted the results of the descriptive assessment based upon the relationship between problem behavior and antecedent events only (Freeman et al., 2000; Sasso et al., 1992). For example, Freeman et al. examined the rate of problem behaviors occurring in several, pre-selected antecedent conditions (e.g., demand situation, attention diverted, tangibles unavailable). Hypotheses about the function of problem behavior were derived from this analysis of antecedent conditions, without the inclusion of consequence events. To date, no research has directly addressed the relative importance of antecedent and consequence event analyses in designing valid descriptive assessments. According to Bijou et al.

(1968), descriptive assessments should include both antecedent and consequence events. Antecedent events may provide information about the establishing operations or setting events contributing to problem behavior, whereas consequences may provide information about the reinforcers maintaining problem behavior.

Lerman and Iwata (1993), disagree with Bijou et al. (1968). According to Lerman and Iwata, an analysis of consequences may identify erroneous controlling variables. For example, if a behavior is not consistently followed by a particular consequence (e.g., the problem behavior only produces attention or escape in some instances), a low conditional probability will result. This is problematic since consequences functioning as reinforcers may be occurring on lean schedules, thus, a functional relationship may not be detected. The opposite may occur when problem behaviors are followed by consequences that do not function as reinforcers. For example, some parents or teachers may provide attention following problem behavior resulting in a large conditional probability. However, it may be that the occurrence of adult attention is correlated with problem behavior, and is not functioning as a reinforcer. Lerman and Iwata suggested that because of these potential errors with the analysis of consequence events, antecedent events may be more important in an attempt to correctly identify the function of problem behavior during descriptive assessments. Additional research is needed to examine the relative importance of antecedent events in collecting and analyzing descriptive assessments. The purpose of this study then, is to examine the occurrence of problem behavior during various naturally occurring antecedent events (presence or absence of tangibles, presence or absence of attention, presence or absence of tasks) in order to hypothesize the function of problem behavior.

Designing Interventions Based on Controlling Variables

Understanding the relationship between problem behaviors and controlling variables has logical implications for the design of effective intervention procedures (Mace et al., 1991). In general, behavioral interventions involve altering consequences and antecedents in order to reduce inappropriate behavior and increase appropriate behavior (Mace, 1994). The identification of behavioral function improves the ability to develop effective treatment in several ways (Iwata, Kahng, Wallace, & Lindberg, 2000). First, it allows for the identification of specific establishing operations under which behavior is more likely to occur (e.g., demand situations, periods of low attention). Altering those antecedents should decrease the occurrence of the behavior. Second, it allows for the identification of the consequences controlling problem behavior. Eliminating the delivery of reinforcers controlling problem behavior should decrease the occurrence of the problem behavior. Third, the reinforcer controlling problem behavior may be used to strengthen, or reinforce alternative behaviors. For example, by replacing problem behavior with a more appropriate behavior, that provides the same consequence/reinforcer. Finally, results of a comprehensive functional assessment will help identify which reinforcers and treatment components are critical for treatment to be effective. In sum, the results of a comprehensive functional assessment allow for a truly individualized treatment plan based on individualized assessment results.

Consequence Based Interventions

Consequence based interventions are those in which consequences are manipulated in order to reduce problematic behavior. In general, consequence based interventions terminate reinforcement for problematic behavior, termed extinction.

Whenever possible, consequence based interventions aim to provide reinforcement for adaptive behavior that may compete with or serve the same function as the maladaptive behavior (Mace, 1994). Thus, extinction is used to reduce problem behavior, and reinforcement is used to increase other appropriate behavior that serve the same function as the problem behavior.

In a study by Sasso et al. (1992), independent descriptive and functional analyses were conducted to identify the function of problem behavior for 2 children with developmental disabilities. Based on the results of these assessments, researchers found that tangible items and escape maintained problem behavior for one child, and that escape maintained problem behavior for the second child. For the first child, an intervention was implemented which involved termination of the identified reinforcers (escape and tangibles) following problem behavior. In addition, a manding response was reinforced with a brief escape from the task, and access to preferred items. In this case, the intervention was successful in reducing problem behavior. For the second child, an intervention was implemented which involved guided compliance serving as escape extinction. In other words, escape from tasks was no longer permitted following problem behavior, and the child was guided to complete the assigned task. This intervention was also successful in reducing problem behavior

Antecedent Based Interventions

Antecedent based interventions have been implemented when maladaptive behavior is shown to correlate with certain antecedent or concurrent stimuli. Antecedent interventions often involve minimizing the presentation of problematic stimuli in the individual's environment (Mace & Roberts, 1993). For example, Ringdahl et al. (1997)

manipulated the amount of preferred materials in the immediate environment in order to reduce problem behavior for 3 children with developmental disabilities. In this study, a preference assessment was conducted in order to identify items that the individuals preferred to engage with. Researchers found that when the environment was enriched with preferred materials, appropriate behaviors (item manipulation) increased and self-injury decreased.

An antecedent manipulation of school tasks has also been useful in decreasing problem behavior (Dyer, Dunlap, & Winterling, 1990; Foster-Johnson, Ferro, & Dunlap, 1994; Winterling, Dunlap, & O'Neill, 1987). For example, Foster-Johnson et al. altered the type of curricular activity presented in order to reduce problem behaviors in children with moderate to severe developmental disabilities. In this study, 3 children ranging in age from 9 to 15 years old were instructed to complete both preferred and nonpreferred instructional activities. Preference for activities was identified experimentally through a preference assessment. For each child, preferred and nonpreferred academic activities were similar in required response topographies, but involved different materials and contexts. For example, for two of the children the nonpreferred activity involved correctly giving coins to the teacher, whereas the preferred activity involved pretending to purchase an item using the required coins. For all three children, problem behaviors decreased and appropriate behaviors increased when preferred instructional activities were presented. Thus, teachers were able to reduce problem behavior by altering the antecedent variable of task preference.

Implications of Related Research

Researchers have made a point to examine the concurrent validity of results based on functional and descriptive assessments. However, little attention has been directed toward modifying descriptive assessment procedures to improve their utility (Freeman et al., 2000). In addition, variations in the methodology used to collect and analyze descriptive assessment data may yield inconsistent findings across studies. Additional research is needed to accurately identify the characteristics of descriptive assessments that are more likely to yield functions congruent with those identified in a functional analysis. One possible alternative that has not been empirically studied is examining the occurrence of problem behavior during various naturally occurring antecedent events (presence or absence of tangibles, presence or absence of attention, presence or absence of tasks) in order hypothesize the function maintaining problem behavior and then compare those results to the experimental functional analysis findings.

Purpose of the Study

The purpose of this investigation is to compare the results of direct descriptive assessments to the findings of a functional analysis. In addition, this investigation introduces a novel technique of direct descriptive assessment. For one, the methodology used in this descriptive assessment involves examining the relationship between antecedent conditions and problem behavior. In other words, establishing operations are used to identify hypothesized function. Second, the methodology in this study involves the use of real-time data collection as opposed to interval recording systems used by others (e.g., Mace & Lalli, 1991; Sasso et al., 1992). Finally, this investigation will examine the relationship between descriptive and functional assessments across two naturalistic settings, the home and school (general education classroom).

Experimental Questions

The study is designed to answer the following questions:

1. Are the findings of an antecedent analysis of descriptive observations at home predictive of the results of a functional analysis at home?
2. Are the findings of an antecedent analysis of descriptive observations at school predictive of the results of a functional analysis at school?

CHAPTER 3
METHOD

Participants

Participants in this project included 3 children enrolled in a USDOE grant project (Conroy & Asmus, 1999), which involved assessment and treatment of problem behaviors for students with autism or ASD. In order to participate in the project, participants had to meet the following four criteria. First, the child had been diagnosed with autism or ASD. Second, the child demonstrated problematic behavior. Third, the child was included in general education at least 50% of the time. Fourth, consent to participate in this study was obtained from the school principal, teacher, and parents. The following is a brief description of each child.

Josh was a seven-year-old Caucasian male diagnosed with ASD. Targeted problem behaviors included noncompliance, disruption, and off-task behaviors. Josh's composite score on the Kauffman Assessment Battery for Children (KABC) was 78, which placed him in the below average range. Josh was enrolled in a 1st grade general education classroom for 83% of the day. He received special education services in reading and writing one to five hours per week. Josh also received speech and language services three times a week for 30 minutes and occupational therapy once a month for 30 minutes.

Derek was a 7-year-old Caucasian male diagnosed with autism and language impairment. The primary behaviors of concern were noncompliance, disruption, and tantrums. Intellectual assessments placed him in the below average range with a composite score of 77 on the Stanford-Binet IV. Derek was enrolled in a 1^{st} grade inclusive general education classroom for 84% of the time. A general education and special education teacher were present in the classroom. He received speech and language therapy and occupational therapy on a weekly basis. Derek was on several medications for his problem behaviors and seizures including: Depakote, Risperdal, and Zoloft.

Rachel was a 6-year-old Caucasian female diagnosed with autism. The primary behaviors of concern were noncompliance, screaming and tantrumming, and disruption. Rachel was enrolled in an inclusive general education kindergarten classroom for the entire school day. She received services for speech and language therapy and occupational therapy 2 times per week for 30 minutes.

Therapists and Setting

Assessment procedures were conducted at both home and school for all three participants. The assessment procedures included (a) descriptive antecedent assessments involving naturalistic observations and, (b) experimental functional analyses. In all cases, descriptive assessments were conducted prior to experimental analyses.

For the descriptive assessment, participants were observed in their natural environments. At school, observations were conducted during regularly scheduled classroom activities while the students were in general education classes. Observations were typically conducted during students' independent seatwork, group instruction, and one on one instruction across a variety of academic subject areas. At home, observations were conducted at the participant's residence. Observations were conducted during naturally occurring home routines, which typically included leisure activities, completing household chores or homework, self-care activities, and mealtimes. In general, participants were observed in their bedroom, in the family living area, in the dining area, or in the yard outside the home.

Functional analyses were conducted at both home and school. Home sessions were conducted at the participant's residence in either the child's bedroom or the living area. At home, parents served as therapist for the experimental sessions. Trained graduate students provided instruction and coaching for the parents both prior to and during the sessions. During home sessions, two to three experimenters were present to operate the video equipment, record behaviors, and coach the parent. School sessions were conducted in an unoccupied classroom or workroom at the child's school. During the school sessions no other children were present and the only adults present were trained graduate students. At school, trained graduate students served as therapists.

During all assessment procedures, a standard VHS camcorder on a tripod was used to videotape all sessions.

Materials and Tasks

Familiar items, rated as preferred by the parent or teacher and verified through a preference assessment, were presented to the child during the play sessions, tangible sessions, and attention sessions in the functional analysis. Preference assessment procedures were based on those used by DeLeon and Iwata (1996) and involved providing the child with noncontingent access to several items during one 5-minute session prior to the beginning of each tangible condition. During the preference assessment, a second by second recording system was used to measure the percent of seconds during which the participant interacted with each item. The item the participant played with the most was identified as the higher preference item.

For Josh, items identified as highly preferred included books, puzzles, hand-held electronic games, and toy cars at school, and video games and books at home. For Derek, the most highly preferred items included toy trains, books, and balls at home and school. For Rachel, the most highly preferred items at home included dolls, a dollhouse, and books at home; and puzzles and farm toys at school.

Nonpreferred tasks were identified through teacher and parent report and were presented during the escape condition of the functional analysis. Criteria for selection of tasks included (a) parent or teacher report that the child had the necessary skills to perform the requested activity, (b) parent or teacher report that the task had been presented to the participant previously either at home or school, and (c) parent or teacher report that the task was difficult, or occasioned problem behavior for the participant. During the escape conditions, Josh was instructed to write spelling words, Derek was instructed to write letters at home and read words at school, and Rachel was instructed to put toys or clothes away at home and complete spelling or drawing tasks at school.

Response Definitions

Several assessment tools were used to identify problem behaviors. First, direct observations of the participants were conducted at both home and school in order to identify topography and frequency of problem behaviors. In addition, structured and unstructured interviews of parents and teachers were conducted. Structured interviews involved the use of the Functional Analysis Interview Scale (FAI) (O'Neill et al., 1997). Information from the FAI was used to operationally define problem behaviors occurring at home and school. For each child, several problem behaviors were identified and operationally defined. Targeted behaviors and operational definitions were consistent across home and school settings for each child. The targeted problem behaviors, and operational definitions for each child were as follows:

Josh

Disruption. Defined as any of the following, singly or in combination with other behaviors: verbal talk which was out of context or loud without permission ("Hey Teacher"), making noises (tapping pencil), pounding on tables/walls/floor with a closed fist foot or object, throwing objects (not at another person), ripping/tearing objects, writing on inappropriate objects (e.g., a desk), screaming, yelling, and not playing with toys or materials appropriately.

Noncompliance. Defined as the failure to complete an instruction, or begin to follow the instruction 5 seconds after the request had been given (e.g., if the teacher tells the child to match the word to the picture and the child does nothing).

Off-task. Defined as the participant not facing task materials or the instructor, or not participating in instructional activity following a request to complete the task (e.g., putting head on table while other students are in reading time).

Derek

Disruption. Defined as rocking back in chair on two legs or throwing work or play materials.

Noncompliance. Defined as the failure to complete an instruction, or begin to follow the instruction (e.g., in the case of a non-discrete task of cleaning up the toys) 5 seconds after the request had been given (e.g., if the teacher told the child to match the word to the picture and the child did nothing).

Tantrums. Defined as screaming and crying, or multiple topographies of behavior occurring at once (e.g., flopping, kicking, screaming, pulling away from others, running away from others, etc.).

Rachel

Disruption. Defined as throwing work or play materials.

Inappropriate vocalizations. Defined as verbal aggression (e.g., "I don't want your stinky breath on me", "I don't like you"), saying something is in her food (e.g., saying spit or other foreign object (that is not there) is in her food), bathroom talk (e.g., discussing bodily functions that happen in the bathroom).

Off-task. Defined as not facing task materials or the instructor, or participating in the instructional activity; but not within 10 seconds following a request to complete a task.

Aggression. Defined as hitting, kicking, throwing objects at people, biting or pinching.

Descriptive Antecedent Assessment Conditions

During Phase 1, the descriptive antecedent assessment, information on three antecedent factors, decided apriori, was recorded as it naturally occurred. Antecedent factors included (a) Tangible on/off (the presence or absence of tangible items), (b) attention on/off (presence or absence of adult attention), and (c) task on/off (the presence or absence of task demands). The antecedent events in the descriptive assessment were selected specifically because of their relationship to experimental conditions in the functional analysis. For example, the antecedent event of task-on was similar to the escape condition in the functional analysis in that in both instances, the participant was being instructed to complete a non-preferred activity. Likewise, the antecedent event of attention-off was similar to the attention condition in the functional analysis in that in both instances adult attention was diverted. Finally, the antecedent event of tangible-off was similar to the tangible condition in the functional analysis in that in both instances, preferred tangible items were not available.

Tangible-on/off

This was the global category used to determine if the child had access to tangible items. Tangible-on was scored when an adult gave the child permission to interact with tangible items (i.e., an area, activity, or an object that was preferred). For example, tangible-on was scored when the child was permitted to play video games, or play with toys. Tangible-on was also scored when the child was engaged in a preferred activity, and an adult made no attempt to interrupt the behavior within 10 seconds of its occurrence (e.g., the child left a task area to play with a toy and the teacher or parent did not redirect the child back to the task or task area). Tangible-off was scored when an adult physically removed the child from an activity, removed the activity from the child, or when all edible items were consumed.

Attention-on/off

This was the global category used to determine if the child had access to adult attention. Attention-on was scored when an adult touched the child or was in proximity to the child. Proximity was defined as an adult being within one arms length of the target child. Attention-on was also scored when the adult was speaking to the class, a group of children (e.g., target child and sibling(s)), or to the target child. Attention-off was scored when an adult diverted his or her attention from the target child, was not in physical proximity to the target child, or was talking to another child for at least 3 seconds and was not talking to the whole class (or all family members).

Task-on/off

This was the global measure used to identify if a task demand situation occurred. Task-on was scored when the target child was required to complete an academic task. Academic tasks were signaled by discrete instructions (e.g., "do problem one," "read this word"), instructions whose completion was not discrete (e.g., "clean your room"), or when no instruction was provided, but a structured expectation of engagement in an academic task was present (e.g., independent seatwork, chores). Task-off was scored when the demands of the task had been completed or when the task had been removed for at least 5 seconds.

Data Collection

While either watching sessions in-vivo, or on pre-recorded videotapes, observers collected data on child behaviors and antecedent events using a Hewlett Packard ® Jornada 820 handheld PC and the Multiple Option Observation System for Experimental Studies (MOOSES2) (Tapp, Wehby, & Ellis, 1995). MOOSES2 is a software program that allows for collection and analysis of data obtained from observing environmental events and/or participants' behaviors. This system collects three different types of data: 1) event data, in which events and related times are entered into a data stream; 2) toggle data, in which hitting a key turns a certain "state", or contextual event, on or off; and 3) interval data, in which a code is entered on a fixedinterval time schedule (i.e., every 30 seconds). As events are keyed into the computer, they are automatically marked with entry times. These different data types can be collected simultaneously during an observation session and later merged for the purpose of analysis.

In this study, MOOSES2 was used to record child behaviors as event data, and antecedent events as toggle data. At the onset of each session, the experimenter activated MOOSES2 and recorded events and target behaviors as they occurred. Each antecedent event category (tangible on/off, attention on/off, and task on/off) consisted of two mutually exclusive codes. In other words, scoring tangible-on would automatically terminate tangible-off. On the other hand, turning tangible-on would have no effect on the other antecedent event categories (attention on/off or task on/off).

For the descriptive assessment, observations were coded as sessions lasting between 10 to 20 minutes. For the functional analyses, each experimental condition was coded as a separate session, each lasting 5 minutes. Based on this scoring system, information was generated regarding the occurrence of relevant child problem behaviors as well as the occurrence of specific antecedent and consequence events.

Interobserver Agreement

Trained graduate students served as primary and secondary data recorders for all sessions. Interobserver agreement comparisons were calculated based on a comparison of the primary and secondary observers. For the descriptive and experimental sessions, an agreement was scored if both the primary and secondary observers coded the same response within 10 seconds of one another. A disagreement was scored if either observer coded responses outside this 10-second window, or did not record the behavior at all. Exact agreement coefficients were calculated by dividing the total number of agreements by the total number of agreements plus disagreements, multiplied by 100 (Kazdin, 1982).

Descriptive Assessment Agreement

Interobserver agreement (IOA) was collected for the descriptive assessments for home and school sessions. At school, agreement was conducted for 32% of sessions for Josh, 33% for Derek, and 33% for Rachel. At home, IOA was conducted for 23% of sessions for Josh, 29% for Derek and, 33% for Rachel.

Interobserver agreement for descriptive assessments was calculated separately for child behavior codes and antecedent codes. Agreement for child behavior codes at school ranged from 85% to 96% for Josh (M = 92%), 90% to 100% for Derek (M = 95%), and 78% to 100% for Rachel (M =91%). Agreement for child behavior codes at home ranged from 78% to 94% for Josh (M = 89%), 83% to 91% for Derek (M = 86%), and 82% to 100% for Rachel (M = 92%).

Agreement for antecedent events at school ranged from 67% to 100% for Josh (M = 90%), 99% to 100% for Derek (M = 99%), and 98% to 100% for Rachel (M = 99%). Agreement for antecedent events at home ranged from 96% to 100% for Josh (M = 99%), 98% to 99% for Derek (M = 99%), and 99% to 100% for Rachel (M = 99%).

Agreement for data selection for the visual analysis of descriptive assessments was conducted. Interobserver agreement comparisons were calculated based on a comparison of a primary and secondary rater. Agreement was scored if both the primary and secondary observers selected the same termination point for a graphical display. A disagreement was scored if the primary rater and the secondary rater selected different termination points. Exact agreement coefficients were calculated by dividing the total number of agreements by the total number of agreements plus disagreements, multiplied by 100 (Kazdin, 1982). Agreement for the data selection for visual analysis was 78%

Functional Analysis Agreement

Interobserver agreement was conducted for each of the participants at both home and school. Agreement for sessions conducted in the participant's school was collected for 30% of sessions for Josh, 27% for Derek, and 33% for Rachel. At home, IOA was conducted for 30% of sessions for Josh, 30% for Derek, and 33% for Rachel.

Agreement for child behavior codes at school ranged from 25% to 100% for Josh (M = 84%), 62% to 97% for Derek (M = 88%), and 67% to 93% for Rachel (M = 84%). Agreement for child behavior codes at home ranged from 63% to 100% for Josh (M = 87%), 77% to 100% for Derek (M = 92%), and 68% to 100% for Rachel (M = 93%).

Descriptive Antecedent Assessment

Design

In this study, MOOSES2 was used to record child behaviors and antecedent events as they occurred in real-time. Information from MOOSES2 was used to conduct a multi-level analysis of problem behavior during certain antecedent conditions. A multi-level analysis provides a report of the frequency of different behaviors across specified antecedent variables. A multi-element design was used to graphically display and visually analyze the data. For example, a multi-element design allows for the comparison of the rate of aggressive behavior when a task is being presented versus the rate of aggression when no task is present. No experimental design was used, however initiation of data collection was counterbalanced across home (Rachel) and school (Derek, Josh) settings.

Procedure

Each participant was observed and videotaped at varied times during school and home activities. Prior to initiation of data collection, a copy of each child's daily schedule was obtained to ensure that observations included a representative sample of activities. At both home and school, attempts were made to observe the participant in a variety of situations and activities, as allowed by the school, family, and teachers. Observations were conducted once or twice per week for several weeks. For Josh, 6 hours of observations were conducted at school and 11 hours at home. For Derek, 9.5 hours of observations were conducted at school, and 6.5 hours at home. For Rachel 5 hours of observations were conducted at both home and school.

During descriptive assessments, parents and teachers were instructed to interact as normally as possible with the participant and to engage in whatever activity would normally occur at the time the observations were conducted. Throughout the observations, the observers followed the child as unobtrusively as possible to any part of the home or classroom. The observers did not interact with the participant at any time. In order to control for reactivity effects, observers set up the camera without collecting data for 1 to 2 hours in the home and school setting prior to initiating data collection

Functional Analysis

Design

In the functional analysis, participants were exposed to 5 conditions similar to those described by Iwata et al., (1982/1994). The conditions were presented in a multi-element design (Kazdin, 1982). In a multi-element design, two or more independent variables are administered separately, in an alternating fashion, so that the effects of the different conditions can be evaluated. In this study, three to six 5-minute conditions were conducted each session in a random sequence.

Procedure

Functional analyses, based on the methodology described by Iwata et al., (1982/1994) were conducted at home and school for each participant. The purpose of this analysis was to identify functional relationships between environmental events and problem behavior.

Functional analysis sessions were conducted 1-2 times per week in 5-minute conditions, for approximately 45-60 minutes per day. Functional analysis sessions were continued until data met criteria for termination. The criteria for termination was based on overall level (magnitude), trend (slope), and stability (variability), according to procedures described by Tawney and Gast (1984). In general, a three-point rule was utilized in determining an end point for visual analysis. This meant that the last three data points had to be fairly stable in order to identify the end of the data collection for purposes of visual analysis. However, that stability had to be present across conditions. During each session several experimental conditions were presented in random order. The conditions included: play, tangible, attention, escape, and ignore.

Play condition. In the play condition, the therapist provided the participant with noncontingent access to preferred materials (e.g., toys, books). In addition, the therapist interacted with the participant by providing a neutral comment every 15 seconds, such as “good playing,” or “hi.” No instructions were provided during play sessions. Appropriate responses from the participant were praised, and all instances of inappropriate behavior were ignored. This condition was intended to simulate an enriched environment and was designed to serve as a control for the other four conditions. Minimal problematic behavior was expected to occur in this condition.

Attention condition. In the attention condition, the therapist (a) provided the participant with noncontingent access to preferred materials (e.g., toys, books) and (b) provided the participant with attention contingent on target problem behavior. At the onset of the session, the therapist explained to the participant that attention would be diverted (e.g., "I have to work now"). Contingent on each occurrence of the selected target behavior the therapist provided a disapproving comment (e.g., "Don't do that"), for 15 seconds. The therapist redirected the first request for attention (e.g., “remember I have to work now”) and ignored each subsequent occurrence of non-target behavior including appropriate requests for attention. This condition was designed to assess the effects of positive reinforcement in the form of social attention on the rate of problem behavior.

Tangible condition. In the tangible condition, the therapist (a) provided the participant with noncontingent access to attention, and (b) provided the participant with preferred tangible items contingent on problem behavior. Prior to the sessions, participants were provided access to the preferred items for one minute. At the onset of the session, the therapist explained to the participant that tangible items would be unavailable (e.g., "It's my turn to play with this"), while keeping the item in view of the participant. Contingent on each occurrence of the target problem behavior the therapist provided access to the tangible item for 15 seconds. The therapist redirected the first request for access to the tangibles item (e.g., "it's still my turn") and ignored each subsequent occurrence of non-target behavior including appropriate requests for the item. This condition was designed to test the effects of positive reinforcement in the form of preferred items on the rate of problem behavior.

Escape condition. In the escape condition, the therapist presented continuous instructions to the participant using a graduated prompting procedure (verbal instruction, modeling, physical guidance). Contingent on the occurrence of problem behavior, the therapist terminated instruction by removing the materials and moving away for 15 seconds. The therapist provided neutral descriptive praise ("you wrote the word ball") if the participant complied with the instruction. All other non-target behaviors were ignored. This condition was designed to assess the effects of negative reinforcement on the rate of problem behavior.

Ignore condition. In the ignore condition, both tangible items and adult attention was removed. Tangible items were removed from the room and access to any other items in the room (e.g., sink, bulletin board) was blocked. In addition, the therapist ignored the participant throughout the session. The ignore condition was designed to assess the effects of automatic reinforcement on the rate of problem behavior.

Data Analysis

Using MOOSES2 real-time data collection system, information was generated regarding the sequence, frequency, and duration of relevant problem behaviors and antecedent events. Based on this information, the descriptive assessments and the functional analyses were analyzed. In addition, the descriptive assessments and functional analyses were compared to one another in order to determine the extent to which the two assessments produced congruent findings.

Descriptive Antecedent Assessment

Data for descriptive assessment was analyzed using a single-subject design for each participant across home and school settings. This allowed for a within-subject comparison of the rate of problem behavior during various antecedent conditions. Based on information generated from MOOSES2, analysis of the rate of problem behavior during each antecedent condition (tangible on/off, attention on/off, and task on/off) was calculated. Table 3-1 outlines the process of analyzing descriptive assessment data.

The first step in analyzing the descriptive assessments involved selecting data representative of each antecedent category. In order to have a representative sample for comparison, sessions during which the antecedent event of interest occurred for at least 20% of the total session length were identified. For example, when examining the presence of task demands, 20-minute sessions (1200 seconds) where task demands were recorded for 240 seconds were included in the analysis (1200/240=20%). However, 20-minute sessions where task demands were recorded for 100 seconds were not included (1200/100=12%).

Table 3-1: Procedure for Analyzing Descriptive Assessment Data

Procedure
1) Identify sessions where the target antecedent event occurred for at least 20% of the session length.
2) Calculate the rate of problem behavior during each antecedent event for selected sessions. Formula for rate = $\frac{\text{\# of problem behaviors during antecedent event}}{\text{\# of minutes antecedent occurred}}$
3) Make a graphical and statistical comparison for all data pointes (using the Mann-Whitney U) of the rate of problem behavior when: a) Tangible-on vs. Tangible-off b) Attention-on vs. Attention-off c) Task-on vs. Task-off
4) Make a graphical and statistical comparison for selected data points (using the Mann-Whitney U) of the rate of problem behavior when: a) Tangible-on vs. Tangible-off b) Attention-on vs. Attention-off c) Task-on vs. Task-off

In the second step, rates of problem behavior during each antecedent event, for each session, were calculated. Rates were calculated by dividing the number of problem behaviors that occurred during an antecedent event by the number of minutes an antecedent event occurred. For example, during a session where task-on occurred for 5 minutes (300 seconds) and six problem behaviors occurred during those 5 minutes, the rate of problem behaviors was 6/5, or 1.2 problem behaviors per minute. Rates are reported as the number of problem behaviors occurring per minute during an antecedent event.

Third, graphical and statistical comparisons were made between the rate of problem behavior during each antecedent category. For the statistical analysis a Mann-Whitney U was used to compare the rates of problem behavior during each of the antecedent event dyads (tangible on/off, task on/off, attention on/off). In other words, the rates of problem behavior when during tangible-on was compared to the rate of problem behavior during tangible-off, the rates of problem behavior during attention-on was compared to the rates of problem behavior during attention-off, and the rate of problem behavior during task-on was to the rate of problem behavior during task-off. A significant difference in rates of problem behavior existed if the statistical comparison produced a p-value less the 0.05.

Statistical analyses of the descriptive assessment was conducted in two ways. First, in analysis 1, a statistical comparison was made between all data generated in the descriptive assessments. Second, in analysis 2, graphs that were generated and analyzed for analysis 1 were subsequently re-analyzed in order to better match the procedures used in the functional analysis. In the descriptive assessment, length of observation time for each participant was determined arbitrarily (e.g., five to ten hours). However, in the functional analysis, decisions about stopping data collection were based on overall level (magnitude), trend (slope), and stability (variability), according to procedures described by Tawney and Gast (1984). Therefore, in analysis 2 of the descriptive assessment, an attempt was made to identify (post-hoc) where data collection should have terminated had similar criteria been implemented in the descriptive assessments, as was done for the functional analysis. Therefore, graphs were examined in order to determine visually at what point data collection would have stopped if the data had been plotted and examined on a daily basis. In general, a three-point rule was utilized in determining an end point for visual analysis. This meant that the last three data points had to be fairly stable in order to identify the end of the data collection for purposes of visual analysis. However, stability had to be present across dyads or else additional three point trends were evaluated further along in the data.

The statistical analysis of descriptive assessments was used to identify hypothesized behavioral functions. Table 3-2 outlines how the correspondence between results of the descriptive assessments and hypothesized functions. In other words, analysis 1 and analysis 2 provided information suggesting the role of positive (attention and tangible items) and negative (escape) reinforcers on problem behavior.

Functional Analysis

For the functional analysis, rate of problem behavior was generated for each experimental condition. Rate was calculated by dividing the number of problem behaviors that occurred in a session by the total number of minutes in a session (i.e., 5). Rates of problem behavior were plotted in temporal order to compare problem behavior in each session. Experimental conditions with the highest rates of problem behavior identify a functional relationship between problem behavior and a particular consequence. For example, if problem behavior occurred most frequently in the escape condition, then problem behavior was determined to be functionally related to negative reinforcement (escaping task demands).

Table 3-2: Correspondence Between the Results of the Statistical Analysis of Descriptive Assessments and Hypothesized Function

Results of Descriptive Assessment	Hypothesized Function
1. If rate of problem behavior higher during task-on than task-off	Negative Reinforcement (Escape Function)
2. If rate of problem behavior higher when attention-off than attention-on	Positive Reinforcement (Attention Function)
3. If rate of problem behavior higher when tangible-off than tangible-on	Positive Reinforcement (Tangible Function)

Comparing the Results of the Descriptive Assessment and Functional Analysis

For the purpose of this study, the results of the descriptive assessment were compared to the results of the functional analysis in order to determine the extent to which the two assessments produced congruent findings. Results from a visual analysis of the functional analysis provided information regarding the variables maintaining problem behavior. Specifically, a comparison of the rate of problem behavior in each experimental condition differentiated the effects of positive reinforcers (attention and tangible items), negative reinforcers (escape from tasks), and automatic reinforcers on problem behavior. The results of the statistical analysis of the descriptive assessment provided information about the rate of problem behavior in the presence or absence of certain antecedent events, and were analyzed in order to identify hypothesized behavioral functions.

CHAPTER 4
RESULTS

Overview

The purpose of this investigation was to (a) utilize two types of functional behavioral assessments (functional analysis and descriptive assessment) to identify environmental variables controlling problem behavior for 3 students with autism, and (b) compare the results of the functional analyses to the results of the descriptive assessments in two settings (home and school). These questions were addressed by conducting functional behavioral assessments in two phases. In phase one, descriptive assessments were conducted in both the home and school setting for 3 students with autism. In the descriptive assessment, naturally occurring antecedent events and problem behaviors were recorded in real-time. The antecedent events recorded included (a) task on/off (the presence or absence of task demands), (b) attention on/off (the presence or absence of adult attention), and (c) tangible on/off (the presence or absence of preferred tangible items). In the second phase, functional analyses of problem behavior were conducted at home and school. In the functional analysis, analogue conditions were presented whereby programmed consequences were delivered contingent on problem behavior. Functional analyses were used to identify the reinforcers maintaining problem behavior determined via visual analysis.

Results were analyzed in two settings by comparing the descriptive assessment findings to the functional analysis findings in two ways. First, all descriptive assessment data collected was analyzed statistically for comparison to the functional analysis. Second, the descriptive assessment data was visually analyzed to determine a stopping point and then that data was statistically analyzed and compared to the results of the functional analysis.

In general, results of this study did not support the use of antecedent based descriptive assessments to determine behavioral function. There were 10 functions of behavior identified across three participants via the functional analysis across both settings. Analysis 1 identified three functions correctly all for the same child (Josh) across both settings. Analysis 2 also identified three functions correctly but for two participants across different settings (Josh -school and Derek-home). Examining the descriptive assessment data statistically based on an arbitrary stopping point (e.g., 5 to 10 hours for analysis 1) or via visual inspection (analysis 2) yielded similar outcomes in terms of number of correctly identified functions, but for different combinations of participants and settings. Overall then, additional refinements of an antecedent based descriptive assessment are needed to increase the predictability of this assessment to identify behavioral function.

Descriptive Assessment Results

The descriptive assessments were analyzed using two methods. First, in an analysis of all data (analysis 1), a Mann-Whitney U comparison was used to evaluate the difference in response rates occurring in three antecedent category dyads (e.g., tasks-on vs. task-off, attention-on vs. attention-off, and tangible-on vs. tangible-off). Second, in analysis 2, statistical comparisons were used to evaluate the differences in response rates occurring in the three antecedent category dyads for only selected data based on visual analysis selection criteria. The results of the descriptive assessments are presented for each participant in each setting.

Josh

Home setting--analysis 1. The results of the descriptive assessment for Josh at home indicated that problem behavior occurred more frequently during task-on than during task-off (p-value = 0.023); these data are presented in the lower panel of Figure 4-1. Also, problem behavior occurred more frequently during tangible-off than during tangible-on (p-value = .001); these data are presented in the middle panel of Figure 4-1. Finally, although problem behaviors occurred more frequently during attention-on than attention-off at home (p-value < 0.001) (top panel) no attention function was hypothesized because fewer problem behaviors occurred during attention-off. Therefore, a statistical analysis identified tangible and escape functions for problem behavior at home.

Home setting--analysis 2. The dashed line on Figure 4-1 indicates the results of analysis 2 for Josh at home. The results of analysis 2 indicated there was no difference between the occurrence of problem behavior during task-on or task-off (p-value = 0.077) or between tangible-on and tangible-off (p-value = 0.078). In addition, although problem behaviors occurred more frequently during attention-on than during attention-off (p-value = 0.008) no attention function was hypothesized. Therefore, unlike analysis 1, there was no behavioral function identified for Josh at home.

School setting--analysis 1. Analysis 1 of Josh's descriptive assessment at school indicated that problem behavior occurred more often during tangible-off than during

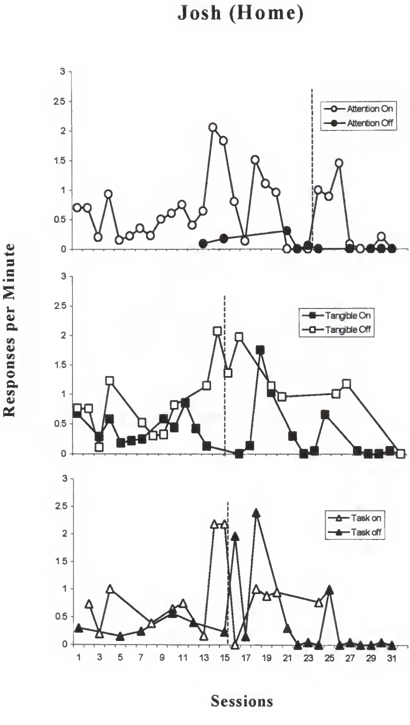

Figure 4-1: A comparison of responses per minute for Josh at home in the antecedent categories attention-on versus attention-off (top panel) tangible-on versus tangible-off (middle panel), and task-on versus task-off (lower panel) for analysis 1 (all data) and analysis 2 (dashed line).

tangible-on (p-value = 0.023); these data are presented in the middle panel of Figure 4-2. With regard to task demands there were only two sessions with task-off, yielding insufficient data to evaluate the possibility of an escape hypothesis (depicted in lower panel). Finally, there was no significant difference between attention-on and attention-off (p-value =0.066) (top panel). Therefore, the statistical analysis identified a tangible function for problem behavior at school.

School setting--analysis 2. The dashed line on Figure 4-2 indicates the results of analysis 2 for Josh at school. Results indicated that problem behavior occurred more frequently during tangible-off than during tangible-on (p-value = 0.014). There was no difference in responding between attention-on and attention-off (p-value = 0.176). With regard to task demands there were only two sessions with task-off, yielding insufficient data to evaluate the possibility of an escape hypothesis (depicted in lower panel). Results of analysis 2 were the same as analysis 1 and indicated a tangible function for Josh at school.

Derek

Home setting--analysis 1. Graphical displays of the results of Derek's descriptive assessment at home are presented in Figure 4-3. Statistical comparisons of Derek's descriptive assessment at home indicated there was no significant difference in problem behavior between tangible-on and tangible-off (p-value = 0.087) (middle panel) or between task-on and task-off (p-value = 0.069) (bottom panel). In addition, problem behaviors occurred more frequently during attention-on than during attention-off at home (p-value < 0.01) (top panel), therefore no attention function was

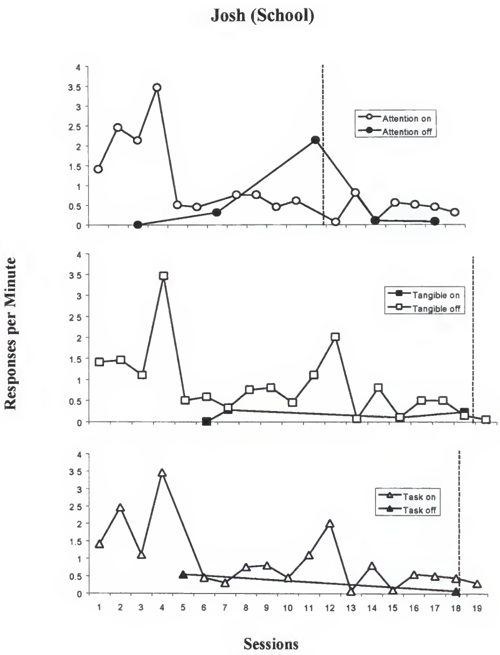

Figure 4-2: A comparison of responses per minute for Josh at school in the antecedent categories attention-on versus attention-off (top panel) tangible-on versus tangible-off (middle panel), and task-on versus task-off (lower panel) for analysis 1 (all data) and analysis 2 (dashed line).

hypothesized. Therefore, statistical analysis data did not indicate a behavioral function at home.

Home setting--analysis 2. The dashed line on Figure 4-3 indicates the results of analysis 2 for Derek at home. Results indicated that problem behavior occurred more frequently during tangible-off than during tangible-on (p-value = 0.035). Also problem behavior occurred more frequently during task-on than during task-on (p-value = 0.032). Since problem behaviors again occurred more frequently during attention-on than during attention-off at home (p-value < 0.001), no attention function was hypothesized. Therefore, unlike analysis 1, analysis 2 identified tangible and escape functions for problem behavior at home.

School setting--analysis 1. Graphical displays of the results of Derek's descriptive assessment at school are presented in Figure 4-4. Statistical comparisons of Derek's descriptive assessment at school indicated there was no significant difference in problem behavior between tangible-on and tangible-off (p-value = 0.059) (middle panel), and between task-on and task-off (p-value=0.076) (bottom panel). In addition, although problem behaviors occurred more frequently during attention-on than during attention-off at school (p-value < 0.01) (top panel) no attention function was hypothesized. Therefore, statistical analysis data did not indicate a behavioral function at school.

School setting--analysis 2. The dashed line on Figure 4-4 indicates the results of analysis 2 for Derek at school. Results indicated that there was no difference in problem behavior between attention-on and attention-off (p-value = 0.093) (top panel), between

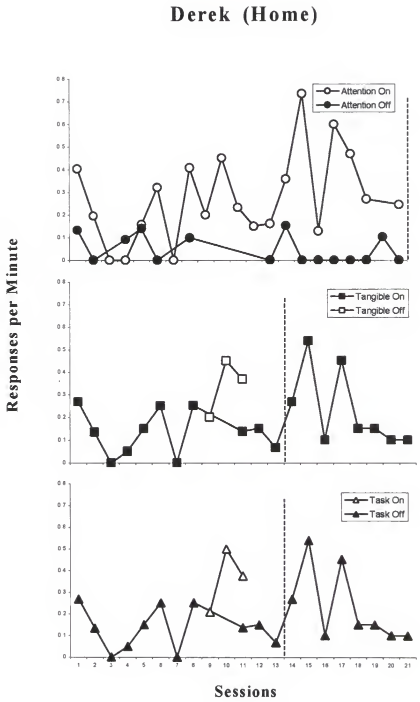

Figure 4-3: A comparison of responses per minute for Derek at home in the antecedent categories attention-on versus attention-off (top panel) tangible-on versus tangible-off (middle panel), and task-on versus task-off (lower panel) for analysis 1 (all data) and analysis 2 (dashed line).

Derek (School)

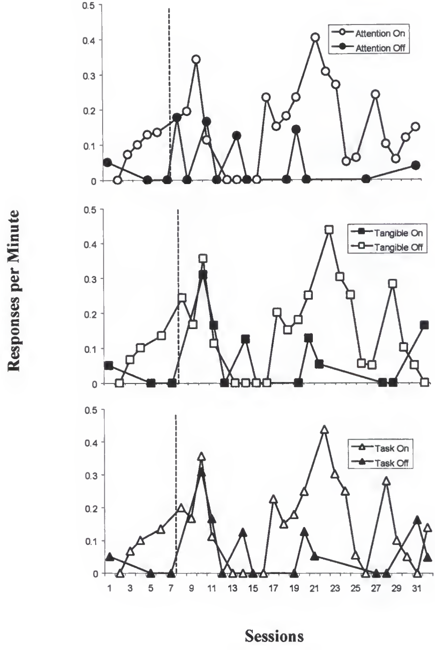

Figure 4-4: A comparison of responses per minute for Derek at school in the antecedent categories attention-on versus attention-off (top panel) tangible-on versus tangible-off (middle panel), and task-on versus task-off (lower panel) for analysis 1 (all data) and analysis 2 (dashed line).

tangible-off and tangible-on (p-value = 0.142) (middle panel), or between task-on and task-off (p-value = 0.142) (bottom panel). Therefore, similar to analysis 1, analysis 2 did not identify a function for Derek's problem behavior at school.

Rachel

Home setting--analysis 1. The results of analysis 1 for Rachel at home indicated that problem behavior occurred more often during task-on than during task-off (p-value <.001); these data are presented in the lower panel of Figure 4-5. There was no significant difference in problem behavior between attention-on and attention-off (p-value = 0.363) (top panel) or between tangible-on and tangible-off (p-value = 0.144) (middle panel). Statistical analysis identified an escape function for problem behavior at home.

Home setting--analysis 2. The dashed line on Figure 4-5 indicates the results of analysis 2 for Rachel at home. Results indicated that problem behavior occurred more frequently during task-on than during task-off (p-value = 0.001) (bottom panel). There was no difference in problem between tangible-off and tangible-on (p-value = 0.171) (middle panel) and between attention-on and attention-off (p-value = 0.678) (top panel). Therefore, analysis 2 was the same as analysis 1, and also identified an escape function for Rachel's problem behavior at home.

School setting--analysis 1. Graphical displays of the results of Rachel's descriptive assessment at school are presented in Figure 4-6. The results of analysis 1 for Rachel at school indicated that there was no significant difference in problem behavior between attention-on and attention-off (p-value = 0.811) (top panel) and

Rachel (Home)

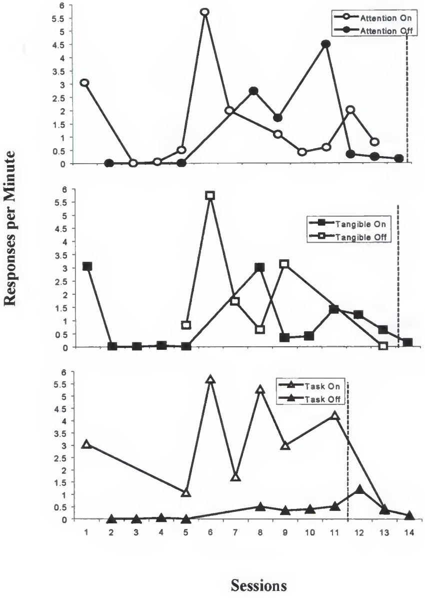

Figure 4-5: A comparison of responses per minute for Rachel at home in the antecedent categories attention-on versus attention-off (top panel) tangible-on versus tangible-off (middle panel), and task-on versus task-off (lower panel for analysis 1 (all data) and analysis 2 (dashed line).

Rachel (School)

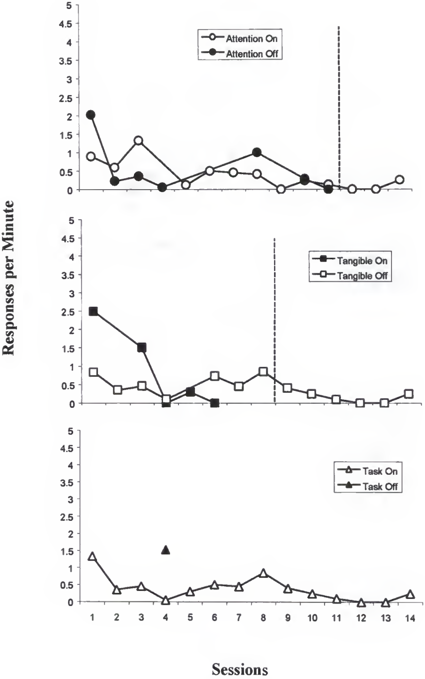

Figure 4-6: A comparison of responses per minute for Rachel at school in the antecedent categories attention-on versus attention-off (top panel) tangible-on versus tangible-off (middle panel), and task-on versus task-off (lower panel) for analysis 1 (all data) and analysis 2 (dashed line).

between tangible-on and tangible-off (p-value = 0.882) (middle panel). In addition, there was only one session where task-off occurred, yielding insufficient data to evaluate the possibility of an escape hypothesis (lower panel). Therefore, statistical analysis did not identify a function for problem behavior at school.

School setting--analysis 2. The dashed line on Figure 4-6 indicates the results of analysis 2 for Rachel at school. The results of analysis 2 indicated that there was no significant difference in problem behavior between attention-on and attention-off (p-value = 0.740) (top panel) and between tangible-on and tangible-off (p-value = 0.684) (middle panel). In addition, there was only one session where task-off occurred, yielding insufficient data to evaluate the possibility of an escape hypothesis (depicted in lower panel of Figure 4-6). Therefore, similar to analysis 1, analysis 2 did not identify a function for problem behavior at school.

Summary of Descriptive Assessment Results

Analysis 1. Table 4-1 summarizes the results of analysis 1 of the descriptive assessment for each of the three students at both home and school. In three cases, significant differences in responding between antecedent conditions were used to hypothesize behavioral function (e.g., Josh at home and school, and Rachel at home). For Josh at home, results of the Mann Whitney U comparison suggested that problem behavior was maintained by access to tangibles and escape from demands. For Josh at school, results suggested that problem behavior was maintained by access to tangible items. For Rachel at home, results suggested that problem behavior was maintained by escape from demands. In three cases (Derek at home and school, and Rachel at

Table 4-1: Results of Analysis 1 for Descriptive Assessment Categories

Student/ Setting	Attention on vs. Attention off	Tangible on vs. Tangible off	Task on vs. Task off	Hypothesized Function
Josh (home)	No Difference (p <0.001)	*Tangible-off higher (p = 0.001)	*Task-on higher (p = 0.023)	Tangible Escape
Josh (school)	No Difference (p = 0.066)	*Tangible-off higher (p = 0.023)	Insufficient data	Tangible
Derek (home)	*Attention-on higher (p < .001)	No Difference (p = 0.087)	No Difference (p = 0.069)	None identified
Derek (school)	*Attention-on higher (p < 0.01)	No Difference (p = 0.059)	No Difference (p = 0.076)	None identified
Rachel (home)	No Difference (p = 0.363)	No Difference (p = 0.144)	* Task-on higher (p <.001)	Escape
Rachel (school)	No Difference (p = 0.811)	No Difference (p = 0.882)	Insufficient Data	None identified

* indicates significant finding

school) there was no significant difference in responding between the antecedent conditions. Therefore, hypotheses regarding environmental variables controlling problem behavior could not be identified.

Analysis 2. Table 4-2 summarizes the results of analysis 2 of the descriptive assessment for each of the three students at both home and school. In three cases, significant differences in responding between antecedent conditions were used to hypothesize behavioral function (e.g., Josh at school, Derek at home, and Rachel at home). For Josh at school, results of the Mann Whitney U comparison suggested that problem behavior was maintained by access to tangibles. For Derek at home, results suggested that problem behavior was maintained by access to tangible items, and escape from demands. For Rachel at home, results suggested that problem behavior was maintained by escape from demands. In three cases (Josh at home, Derek at home and school, and Rachel at school) there was no significant difference in responding between the antecedent conditions. The same number of significant differences was found in comparison to analysis 1, however, the participants data identified as significant differed in analysis 2.

Functional Analysis Results

Josh

Home setting. The results of Josh's functional analyses are presented in Figure 4-7. The top panel displays the results of the functional analysis at home, and the lower panel displays the results of the functional analysis at school. At home, the highest rates of problem behavior occurred in the tangible condition (M = 5.2/min) and escape condition (M = 4.5/min). Lower rates of problem behavior occurred in the attention condition (M = 1.3 /min), ignore condition (M = 0.47 /min), and free play condition (M = .07 /min). These results indicated that Josh's problem behavior at home was maintained by escape from task demands and access to tangible items.

Table 4-2: Results of Analysis 2 for Descriptive Assessment Categories

Student/ Setting	Attention on vs. Attention off	Tangible on vs. Tangible off	Task on vs. Task off	Hypothesized Function
Josh (home)	*Attention-on higher (p = 0.008)	No Difference (p = 0.078)	No Difference (p = 0.077)	None identified
Josh (school)	No Difference (p = 0.176)	*Tangible-off higher (p = 0.014)	Insufficient data	Tangible
Derek (home)	*Attention-on higher (p < .001)	*Tangible-off higher (p = 0.035)	* Task-on higher (p = 0.032)	Escape Tangible
Derek (school)	No Difference (p=0.093)	No Difference (p=0.142)	No Difference (p=0.142)	None identified
Rachel (home)	No Difference (p = 0.678)	No Difference (p = 0.171)	* Task-on higher (p=0.001)	Escape
Rachel (school)	No Difference (p=0.740)	No Difference (p=0.684)	Insufficient Data	None identified

* indicates significant finding

School setting. At school, the highest rates of problem behavior occurred in the tangible condition (M = 2.67 /min). Lower rates of problem behavior occurred in the escape condition (M = 1.0 /min), attention condition (M = 1.27 /min), and free play condition (M = 0.17 /min). Unlike the functional analysis at home, these results indicated that Josh's problem behavior at school was maintained only by access to tangible items.

Josh

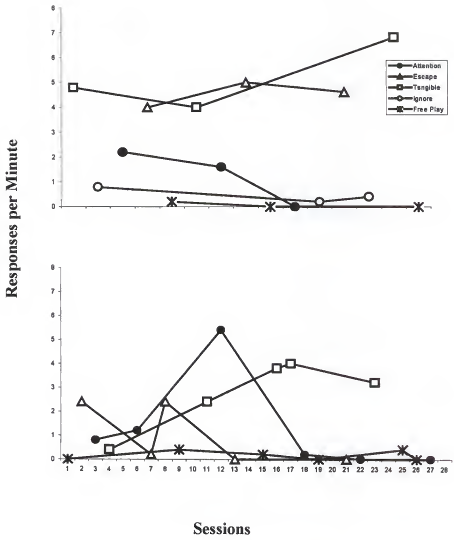

Figure 4-7: Functional analysis for Josh at home (top panel) and school (lower panel).

Derek

Home setting. The results of Derek's functional analyses at home (top panel) and school (bottom panel) are presented in Figure 4-8. At home, the highest rates of problem behavior occurred in the tangible condition (M = 2 /min) and escape condition (M = 2.2 /min). Lower rates of problem behavior occurred in the attention condition (M = 0. 32 /min), ignore condition (M = 0. 07 /min), and free play condition (M = 0.1 /min). These results indicated that Derek's problem behavior at home was maintained by escape from task demands, and access to tangible items.

School setting. At school, the highest rates of problem behavior also occurred in the tangible condition (M = 2.28 /min) and escape condition (M = 2.35 /min). Lower rates of problem behavior occurred in the ignore condition (M = 0.2 /min), attention condition (M = 0. 13 /min), and free play condition (M = 0.1 /min). These results were the same as the home and indicated that Derek's problem behavior at school was also maintained by access to tangible items and escape from task demands.

Rachel

Home setting. The results of Rachel's functional analysis at home (top panel) and school (bottom panel) are presented in Figure 4-9. At home, the highest rates of problem behavior occurred in the tangible condition (M = 15.4 /min). Lower rates of problem behavior occurred in the escape condition (M = 0 /min), attention condition (M = 0.2 /min), ignore condition (M = 1.3 /min), and free play condition (M = 0.2 /min).

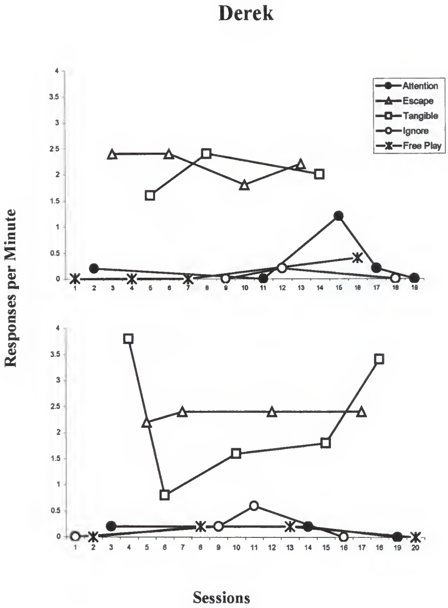

Figure 4-8: Functional analysis for Derek at home (top panel) and school (lower panel).

These results indicated that Rachel's problem behavior at home was maintained by access to tangible items.

School setting. At school, the highest rates of problem behavior occurred in the tangible condition (M = 3.3 /min) and escape condition (M = 1.06 /min). Lower rates of problem behavior occurred in the ignore condition (M = 0.1 /min), attention condition (M = 0 /min), and free play condition (M = 0 /min). These results indicated that Rachel's problem behavior at school was maintained by both access to tangible items and escape from task demands. At home, only a tangible function was identified.

Summary of Functional Analysis Results

In all cases, the functional analysis identified environmental variables controlling problem behavior. In two cases (Rachel at home and Josh at school) problem behavior was maintained by positive reinforcement in the form of tangible items (toys). In four cases (Josh at home, Derek at home and school, and Rachel at school), problem behavior was multiply controlled by both positive reinforcement in the form of tangible items (toys), and negative reinforcement in the form of escape from task demands. For Derek both functions of problem behavior (tangible and escape) were identified across both settings. For Rachel and Josh, a tangible function was identified across both settings, but the escape function was only identified in one setting (home for Josh and school for Rachel).

Summary of the Functional Analysis and Descriptive Assessment Comparisons

Table 4-3 summarizes the predictive results of the descriptive assessments and the actual results of the functional analysis for the 3 participants by setting. In analysis

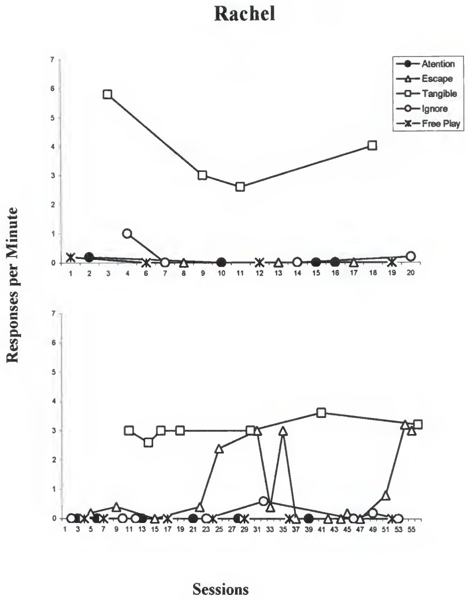

Figure 4-9: Functional analysis for Rachel at home (top panel) and school (lower panel).

1, there were two cases (Josh at school and Josh at home), where the results of the functional analysis were congruent with the results of the statistical comparison of the descriptive assessment. In analysis 2 the results of the functional analysis were also congruent with the results of the descriptive assessment for two cases (Josh at school and Derek at home).

In four cases of analysis 1 (Derek at home and school, and Rachel at home and school) the results of the functional analysis were incongruent with the results of the statistical comparison of the descriptive assessment data. In four cases of analysis 2 (Josh at home, Derek at school, and Rachel at home and school), the results of the functional analysis were incongruent with the results of the statistical visual analysis of the descriptive assessment data. In two cases for analysis 1 and 2(Josh at school, and Rachel at school) there was insufficient data from the descriptive assessment to evaluate all conditions of the descriptive assessment.

Summary

The hypothesized functions of behavior generated by the antecedent descriptive assessments in the home setting were predictive of the function identified by the functional analysis two out of five times (40%) each for analysis 1 and analysis 2. The antecedent descriptive assessment at home had moderate agreement with the function of problem behavior as identified by the functional analysis conducted at home. The hypothesized functions of behavior

Table 4-3: Results of the Functional Analysis and Descriptive Assessment for each Participant

Participant/ Setting	Results FA	Analysis 1 of DA	Analysis 2 of DA
Josh (home)	Escape Tangible	Escape Tangible	None identified
Josh (school)	Tangible	Tangible (Inconclusive for escape)	Tangible (Inconclusive for escape)
Derek (home)	Escape Tangible	None identified	Escape Tangible
Derek (school)	Escape Tangible	None identified	None identified
Rachel (home)	Tangible	Escape	Escape
Rachel (school)	Escape Tangible	None identified (Inconclusive for escape)	None identified (Inconclusive for escape)

generated by the antecedent descriptive assessments in the school setting was predictive of the function identified by the functional analysis 1 out of 5 times (20%) each for analysis 1 and analysis 2. The descriptive assessment at school then had a low agreement with the function of problem behavior as identified by the functional analysis at school. Therefore, neither descriptive assessment across settings was as good a measure as the functional analysis. Although the participants and settings may have differed, use of all descriptive data (analysis 1) and visual analysis descriptive data (analysis 2) did not differ in the number of congruent findings to the functional analysis.

CHAPTER 5
DISCUSSION

Overview

In recent years, the need for effective behavioral assessments has emerged. For example, the reauthorization of the Individuals with Disabilities Act (P.L.105-17; Individuals with Disabilities Education Act Amendments of 1997) requires a functional behavioral assessment (FBA) be conducted for students exhibiting behavior problems that have led to suspension from school for over 10 days. To date, research supports the validity of functional analysis as one form of functional behavioral assessment. However, practical considerations may sometimes preclude its use. Therefore, practitioners commonly utilize alternative methods for conducting functional behavioral assessments.

An alternative category of functional behavioral assessment includes descriptive assessments. In descriptive assessments, correlational information is generated between the occurrence of problem behavior and environmental events. This information may be gathered indirectly (through interviews or questionnaires) or directly (through naturalistic observation). Information gathered from descriptive assessments is then used to hypothesize variables maintaining problem behavior. Typically, the validity of these assessments is evaluated by comparing the results of a descriptive assessment to the results of a functional analysis. A review of previous research evaluating the congruence between direct descriptive assessments and functional analyses reveals inconsistent results. In several cases, direct descriptive assessments were useful in identifying behavioral functions congruent with those found in a functional analysis (Belfiore et al., 1993; Freeman et al., 2000; Sasso et al., 1992). In other cases, descriptive assessments were incongruent with functional analyses (Hall et al., 1997; Mace & Lalli, 1991).

Several possible reasons for the inconsistent congruence between experimental and descriptive assessments exist. For one, the methodologies used to conduct and analyze descriptive assessments differed between researchers (e.g., time spent conducting naturalistic observations, settings where observations were collected). In addition, in previous studies, researchers did not provide systematic methods outlining how the results of descriptive assessments were linked to the identification of hypothesized behavioral function. This is particularly problematic when the results of the antecedent and consequence analyses did not match. For example, in an analysis of naturally occurring events, Belfiore et al., (1993) found that problem behavior occurred most frequently during the antecedent category “required activity”, and that problem behavior was most often followed by the subsequent event “no response from others.” Based on this information the researchers hypothesized that problem behavior was maintained by escape from demands. This hypothesis was made, despite the fact that no problem behavior was followed by the subsequent event “task attenuation,” which is the subsequent event category that would have suggested escape as a function. Thus, it appears that the hypothesized function from the descriptive assessment was derived from the antecedent analysis, although the authors state that results of both the antecedent and consequence analysis were used to generate a hypothesis.

In addition to the inconsistency in methodologies used to conduct and analyze descriptive assessments, researchers disagree about the relative importance of antecedents and consequence events in analyzing descriptive assessments. In the seven studies examined, all but one (Freeman et al., 2000) examined both the occurrence of antecedents and consequences in determining behavioral function. By combining the results of consequences and antecedent analyses researchers attempted to make a more accurate identification of behavioral functional based on all data presented. However, by combining antecedent and consequence analyses, it remains unclear, which of the two variables was most relevant to identify behavioral function. If, for example, the results of the consequence analysis and antecedent analysis do not match (e.g., problem behavior occurred more frequently during the antecedent category "task demands" which is suggestive of an escape hypothesis, yet problem behavior was most frequently followed by the subsequent event "attention delivery" which is suggestive of an attention hypothesis), then currently researchers have no information regarding which variable (antecedent or consequence) is most useful to accurately identify behavioral function. Therefore, more research is needed to identify the relative importance of antecedents or consequences in identifying behavioral function.

Overall, there appears to be several potential variables contributing to the inconsistency between results of functional analyses and results of direct descriptive assessments. In the present study, a novel method for conducting direct descriptive assessments was presented. This novel methodology attempted to address some of the limitations of previous studies. For one, previous researchers did not present a systematic method for determining hypothesized behavioral function, based on the results of the antecedent and consequence analysis. This is particularly problematic when the results of the antecedent and consequence analysis do not match. In the present study, a systematic criterion for determining behavioral function was presented (see Table 3-2). In addition, a statistical comparison was utilized. In the present study a Mann Whitney U comparison was used to examine the statistical difference between antecedent categories. This analysis allowed for more objective criteria in determining hypothesized behavioral function.

In addition to providing systematic criteria for determining behavioral function, the present methodology isolated one variable of interest (antecedent events), rather than combining antecedent events and consequences. This methodology was different from typical descriptive assessments (e.g., Bijou et al., 1968; Mace & Lalli, 1991), which have also incorporated the occurrence of naturally occurring consequences (e.g., attention, task removal) into the formation of hypotheses of behavioral function. According to Lerman and Iwata (1993), the utilization of consequences in analyzing descriptive information may yield errors, particularly if the problem behavior is maintained by intermittent schedules of reinforcement in the natural environment. Therefore, the purpose of this analysis was to isolate the role of naturally occurring, antecedent variables as potential predictors of behavioral function.

Overall, no method of descriptive assessment has emerged as the most effective in identifying behavioral function. Therefore, additional research is needed in order to identify consistently valid methodologies for conducting and analyzing descriptive assessments. The purpose of this study was to determine if this novel descriptive assessment methodology was able to correctly identify behavioral function(s) by examining the occurrence of problem behavior during pre-specified, naturally occurring, antecedent conditions. The antecedent categories examined include (a) attention on/off (b) task on/off and, (c) tangible on/off. Regarding the antecedent condition examining adult attention, if problem behavior occurred more frequently during periods of low attention (attention-off) than during periods when attention was available (attention-on), then problem behavior was hypothesized to function to gain access to attention. Likewise, in the antecedent category examining task demands, if problem behavior occurred more frequently when task demands were present (task-on), then problem behavior was hypothesized to function to escape from demands. Finally, in the antecedent category examining tangibles, if problem behavior occurred more frequently when tangible items were unavailable (tangible-off), then problem behavior was hypothesized to function to gain access to tangibles.

Interpretation of Results

Summary of Results

The main purpose for this investigation was to examine the congruence between hypothesized functions of problem behavior developed via an antecedent-based descriptive assessment and the functions identified for problem behavior based on a functional analysis by setting. Based on the results of this study, a descriptive assessment of naturally occurring antecedent variables was only occasionally predictive of functions identified via functional analyses. Based on a statistical comparison that included all descriptive data, functions identified in the descriptive assessment were congruent with the results of the functional analysis for only two of six cases. Based on a statistical comparison that included selected descriptive data (in order to match the procedures of the functional analysis), functions identified in the descriptive assessment were also congruent with the results of the functional analysis for only two of six cases.

When comparing the results by setting for analysis 1 and analysis 2, the descriptive assessment correctly identified behavioral function for 1 of 3 cases (33%) across the home and school setting. In the home and school setting, five functions of behavior were generated by the functional analysis in each of those settings. In the home, 2of 5 (40%) functions were correctly identified (both for Josh) in analysis 1 and 2 of 5 (40%) functions were correctly identified in analysis 2 (both for Derek). At school, 1of 5 (20%) functions were correctly identified for Josh for analysis 1 and analysis 2.

These data indicated that an arbitrary number of hours to collect descriptive assessment data in comparison to use of visual analysis rules did not change the number of congruent findings. Therefore, future research should explore making decisions about descriptive data collection based on the visual analysis decision rules (e.g., daily plotting of the rates of behavior) for statistical analysis.

In general, the results of this descriptive assessment did not consistently predict the function of problem behavior generated through functional analyses. For the purpose of this study, functional analyses were chosen as a valid indication of a functional relationship between problem behaviors and consequences, since the results of empirical research support this interpretation (e.g., Iwata, Vollmer, & Zarcone, 1990; Mace et al., 1991).

Analyzing the Results of the Descriptive Assessments

According to Lerman and Iwata (1993), descriptive observations have typically been summarized via conditional probabilities or conditional analyses. Conditional probabilities are analyses that compare the relative frequencies of occurrence of some behavior for events of interest (Lerman & Iwata, 1993). This analysis is used because in a descriptive analysis, antecedents and consequences could vary in an uncontrolled manner within each observation session, so a simple analysis of the frequencies of target behavior by session would reveal nothing about the influence of specific variables (Lerman & Iwata, 1993).

Of the studies reviewed, Lerman and Iwata (1993) are the only ones to use the term conditional probability to describe the data calculations conducted for analysis. However, others use similar analyses (e.g., Belfiore et al. (1993) examined the probability of observing target behavior given a particular antecedent event; Mace et al., (1991) examined the probability of observing the target behavior within 20s following the occurrence of a given antecedent). Among the seven studies reviewed five described calculating what is commonly referred to as conditional probabilities (Belfiore et al., 1993; Hall et al., 1997; Lalli et al., 1993; Lerman & Iwata, 1993; Mace & Lalli, 1991). Of those five, various conditional probabilities were calculated. In an analysis of antecedent events, five of the studies calculated the probability an antecedent event preceded or co-occurred with the target behavior (Belfiore et al., 1993; Hall et al., 1997; Lalli et al., 1993; Lerman & Iwata, 1993; Mace & Lalli, 1991), and one calculated the proportion of behavior that occurred during an antecedent event (Lerman & Iwata, 1993). In an analysis of consequences, three studies calculated the proportion of target behavior that was followed by a specific consequence (Belfiore et al., 1993; Hall et al., 1997; Lerman & Iwata, 1993), and three studies calculated the proportion of behaviors that were followed by a consequence given an antecedent event (Lalli et al., 1993; Lerman & Iwata, 1993; Mace & Lalli, 1991). As stated previously the majority of these authors were unclear as to the relative influence of each type of probability analysis in generating hypotheses about behavioral function.

Several researchers have demonstrated that interval data can be useful for generating conditional probabilities, as well as generating the sequential occurrence of events (e.g., Belfiore et al., 1993; Hall et al., 1997; Lalli et al., 1993; Lerman & Iwata, 1993; Mace & Lalli, 1991). This is typically done in two ways. First, subsequent events are recorded if and only if target behavior has occurred. In other words, if the descriptive assessment includes the consequence category of "attention delivery", then attention delivery is scored if attention is delivered at some prespecified time (typically 2-3 intervals) after a target behavior. Likewise, attention delivery is not scored during times when an adult delivers attention, yet no target behavior has occurred. Therefore, each interval scored attention delivery, represents an instance where attention sequentially followed a problem behavior. Second, antecedent events are typically scored throughout the entire observation session, and not just in the interval that they are initiated. In other words, if the descriptive assessment includes the antecedent category "task demands present", then each interval where tasks are present is scored as such (not just the interval where tasks were initiated). Collecting data on antecedent events throughout the session allows for the analysis of the relative frequency of target behavior given the occurrence of antecedent events.

Although interval data collection systems are useful in collecting and analyzing conditional probabilities of descriptive assessments, interval data have been found to be less accurate data collection systems than those that collect data as frequency or rate (Harrop & Daniels, 1986; Powell & Rockson, 1978; Repp, Roberts, Slack, Repp & Berkler, 1976). Therefore, one benefit of the present study was that a real time recoding method was used that allowed for both the collection of conditional probabilities, as well as the use of rate data in order to avoid the error introduced by interval recording systems.

In the current study, the rate of problem behavior was generated given prespecified antecedent events. Thus, for this study, rather than simply calculating a conditional probability, the rate of occurrence for target behaviors was calculated for each of the prespecified antecedent conditions. The use of rate data provides information similar to one type of antecedent comparison made by researchers using conditional probabilities, where researchers calculated the probability an antecedent event preceded or co-occurred with the target behavior (Belfiore et al., 1992; Hall et al., 1997;Lalli et al., 1993; Lerman & Iwata, 1993; Mace & Lalli, 1991). In order to calculate this, researchers divided the number of intervals scored with the target behavior and a given antecedent by number of intervals with antecedent event. In the present study rate was calculated by dividing the number of target behaviors that occurred during an antecedent event by the total number of seconds an antecedent occurred, thus providing information about the occurrence of problem behavior given an antecedent event. Thus, in both calculations similar information was generated about the occurrence of target behaviors during antecedent events. However, with conditional probabilities, the relative occurrence of some behavior is calculated for an event of interest, thus the calculations are reported as proportions or percentages. Using rate, the exact occurrence of a behavior is generated for an event of interest, so percentages are not reported.

One researcher, (Lerman & Iwata, 1993) calculated additional conditional probabilities for an antecedent analysis where the number of intervals containing target behavior that followed an antecedent event was divided by the number of intervals scored with the target behavior. This analysis provided information about the proportion of target behavior that occurred during an antecedent event. In the current study, there was no corresponding calculation conducted. However, it would be possible to calculate such a proportion by dividing the number of target behaviors that occurred during an antecedent event, by the total number of target behaviors that occurred during the session. In this case, data would be reported as a proportion rather than rate. Such a calculation may be potentially informative in determining relative differences in the occurrence of problem behavior during each antecedent event. Future researchers may want to incorporate relative, or proportional occurrence of problem behavior when comparing antecedent events.

Statistical Analysis in Descriptive Assessments

Typically, single-subject research relies solely on the use of visual analysis, rather than statistical analysis. Of the seven studies reviewed, decisions about descriptive assessment data were based on visual analysis alone. According to Perone

(2000), single-subject research can rely on visual analysis when the experimenter is able to establish experimental control. However, in the case of descriptive analyses, there is no experimental control of relevant variables, therefore, all information is correlational. Thus, visual analysis alone may not provide sufficient evidence to make decisions and generate hypothesized behavioral functions.

In the present study, decisions regarding the difference between the rates of behavior in each antecedent category were made based on statistical comparisons. However, graphical displays of the descriptive results were also presented so that a comparison could be made between a statistical and a visual analysis. In several cases, the use of a statistical comparison provided additional information that would not have been identified through visual analysis alone. For example, for Josh at home, a statistical analysis (in analysis 1) revealed a difference between task-on and task-off, as well as between tangible-on and tangible-off. However, a visual analysis of this data did not reveal a difference between these two antecedent categories. In addition, the results from the statistical analysis were congruent with those from the functional analysis. Thus, there is evidence in the present study that a statistical analysis provided information that was not available from visual analysis.

In addition to providing information beyond what could be provided through visual analysis, statistical analysis allowed for a more objective, systematic method for analyzing the results of the descriptive assessments. In this study, a Mann Whitney U comparison was made to compare the differences between the antecedent categories of the descriptive assessment. The Mann Whitney U is a nonparametric statistical analysis, used to determine whether two independent groups have been drawn from the same sample (Siegel, 1957). A nonparametric test is a test whose model does not specify conditions about the parameters of the population from which the sample is drawn. This is different from a parametric test in which certain conditions must be assumed (e.g., populations are normally distributed, populations are not equal in variance, the measurement must be interval scale). Thus, the Mann Whitey U allowed for a comparison of the descriptive assessment data, when no information was available about the distribution and/or variance of data in the descriptive assessments. In addition, the Mann Whitney U was useful in that "it is not necessary for the two samples to be the same size" (Siegel, 1957 pp. 95). In an analysis of the descriptive assessment, all comparisons relied on samples of different sizes. Finally, a Mann Whitney U allows for a comparison of very small samples (less that 8) (Siegel, 1957 pp. 117). In the analysis of descriptive assessments, several of the analyses compared small samples.

An additional benefit to conducting a statistical comparison is that it allows one to generate a p-value. A low p-value points to a rejection of the null hypothesis because it indicates how unlikely it is that the two comparison groups are equal. For example, in analysis 1 for Josh at home, problem behavior occurred more frequently during task-on than during task-off, with a p-value of 0.023. Thus, there is a 2.3 % (0.023 X 100) chance that the null hypothesis was falsely rejected (i.e., a Type 1 error), and that there really is no difference between the two groups. Conducting statistical comparisons adds additional evidence that the decisions made regarding the descriptive assessment data are accurate.

Implications

The findings from this study are important because the utilization of assessment tools that are inaccurate may impede the identification of effective treatments. For example, in this study, the results for Rachel's descriptive assessment at home suggested that problem behavior could be maintained by escape from demands. Based on these findings the treatment implemented would likely have included the removal of the reinforcer during demand situations (e.g., escape extinction). However, escape extinction would probably be ineffective for Rachel because (according to the functional analysis) problem behavior was maintained by access to tangible items. Therefore, it would be problematic had the results of this descriptive assessment been utilized as the sole indicator of behavior function.

Although the present use of descriptive methodology may be insufficient in consistently identifying the variables maintaining problem behavior, results of the descriptive assessment may still have important implications for developing effective treatments in the natural setting. For example, Rachel's functional analysis at home identified access to tangibles as the variable maintaining problem behavior. However, descriptive data reliably found problem behavior occurred more frequently during task demands. Therefore, it would likely be insufficient to develop a treatment that does not address problem behaviors occurring during demands at home. For example, if the treatment for Rachel's problem behavior included extinction (e.g., restricting access to tangibles) and DRA (e.g., asking appropriately for tangibles), then treatment may need to be implemented in the context of ongoing demands in order to be most effective in the natural setting. Future studies should compare the results of treatments based on both functional analysis and descriptive assessment results, to those based on functional analyses alone in order to determine how descriptive assessment results can be utilized to enhance the development of effective treatments.

To date, no method of direct descriptive assessment has been consistently demonstrated to accurately predict behavioral function. However, in several cases, direct descriptive assessments have been useful in identifying behavioral function. Thus, if practicality precludes the use of functional analysis, then a direct descriptive assessment may still be useful in helping to identify relevant controlling variables. Based on this information, practitioners who rely solely on descriptive assessments to identify hypothesized behavioral function should do so with caution, and may need to evaluate the validity of the results of these assessments on an individual case basis. One way to evaluate the results of the descriptive assessment is by continuing to evaluate a treatment (once a treatment package has been established and implemented) through the use of systematic data collection of problem behavior during treatment, as well as through experimental demonstration (e.g., reversals, multiple baselines).

Limitations and Extensions

Limitations

The results of this study contribute to the literature on conducting functional behavior assessments for children with autism who are included in the general education setting, and exhibit problem behavior in natural settings. However, there are five limitations in the proposed descriptive methodology that may have resulted in inconsistencies between the results of the descriptive assessment and the results of the functional analyses and should be taken into account when interpreting the results. First, conditions used in the descriptive assessment may not be sensitive to qualitative differences in variables related to problem behavior. For example, in the attention condition, adult attention was considered available, (and scored as such) if any adult attention was being provided. This broad category of attention may be potentially problematic if a specific form of attention (e.g., reprimand) or attention from a specific source (e.g., teacher, mother) maintains a student's problem behavior. In the case where problem behavior is maintained only by specific forms of attention, problem behavior may occur in the natural environment even when other forms of adult attention are available (scored attention-on). For example, a child may engage in disruptive behavior to gain access to his mother's attention despite ongoing attention being delivered by his father. Thus, the attention on/off, tangible on/off, and task on/off conditions in this methodology may not have captured differences in rates of problem behavior related to the availability of specific types of attention, tangibles, or tasks respectively.

A second limitation is related to presence (or absence) of discriminative stimuli in the environment that set the occasion for behavior to occur. For example, if a child engaged in problematic behavior in order to gain access to attention this problem behavior may only occur in the presence of specific discriminative stimuli (e.g., another person in the immediate environment which serves as the discriminative stimuli that problem behavior will yield attention). However, if the teacher or parent had left the room, then problem behaviors that functioned to gain access to attention may not have occurred, despite the presence of the establishing operation (attention unavailable).

A third limitation was that observations of naturally occurring events did not consistently yield sufficient data for an accurate comparison between antecedent categories, despite lengthy observation periods (at least 5 hours). First, sample sizes were sometimes too small to make comparisons between antecedent conditions. Second, there were several instances where the present methodology of data collection yielded unequal samples sizes where one sample was sufficiently larger than the comparison sample (e.g., for Derek at home, there were 3 data points in the tangible-off category, and 19 data points in the tangible-on category). In both the case of small sample sizes, and unequal samples, interpretation and analysis of the results may be compromised.

With respect to analyses that include small samples sizes, it is difficult to determine if the data generated is sufficient to accurately and completely represent a child's behavior in the natural setting. In the present study, no comparison was made for two cases (Rachel at school, and Josh at school) because insufficient data were generated to make a comparison. In addition to these two cases, several other comparisons relied on very small sample sizes (e.g., 3 or 4 data points). In the present study, Mann Whitney U comparisons were made using these small samples with 3 or more data points. However, such analyses may be problematic or inaccurate. Future researchers should strive to establish a more reasonable minimum of data points for comparison (e.g., 6 or 7 data points) in order generate an adequate representation of the child's behavior patterns in the natural setting.

Had the present study required that seven data points be available to complete the statistical analyses, several additional comparison would have yielded insufficient data (Derek at home and Rachel at home for analysis 1; and Josh at home, Derek at home and school, and Rachel at home for analysis 2). In addition, using a seven data point criteria, several of the comparisons yielding congruent findings (Josh at school for analysis 1 and 2, Derek at home for analysis 2) would not have been identified as congruent, and the consistency of the findings in the present study would have been further reduced.

With respect to cases with unequal samples it is difficult to determine if the two comparison groups yield equally sufficient information to make a true comparison between the groups. In the present study, three cases (Josh at school, Derek at home, and Rachel at school) comparisons relied on unequal samples sizes where one sample was sufficiently larger than the comparison sample. In these cases, it is possible that the data set with the larger number of data points was more consistent or accurate than the data set with few data points. Therefore, a comparison of the two samples may be more likely to yield type 1 or type 2 errors. For example, the results of the comparison may reveal that any difference between the two groups is due to chance. However, if there were sufficient data in both groups a true difference may have been detected (type 2 error). Likewise, results of the comparison may reveal a difference between the two groups. However, if there were sufficient data in both groups then it may be that the difference between the two groups is likely due to chance (type 1 error). Thus, comparing groups with different numbers of data points may be potentially problematic. Future researchers may benefit from alternative methods of collecting data such that all antecedent categories are more equally represented. One way to do this would be to pre-arrange observation times to capture particular events (e.g., set up observation during math to observe task-on and set up observation during lunch to observe task-off).

This way, researchers could better generate equivalent samples for each antecedent group.

A fourth limitation is that the data generated may have resulted in low agreement with the functional analysis because of how the data were collected. The observation times for data collection were selected based on parent and teacher availability and therefore may not have been true representations of times when problem behavior was most and least likely to occur. In addition, observations across different antecedent conditions (task on/off, attention on/off, tangible on/off) occurred for different periods of time and were not systematically equal in duration across dyads or conditions. Future research should focus on more systematic and equalized data comparisons to determine if this will impact the predictive validity of this type of assessment.

A final limitation in analyzing this data was that problem behavior was composed of multiple behaviors and analyzed as one behavior category "targeted problem behavior." Different findings may have occurred if behaviors were separated and evaluated individually across both descriptive and functional analysis assessments. Future research should examine the effects of evaluating each topography of behavior separately across analyses prior to comparison.

Extensions

The results of this study yield additional questions that may be examined through future research. Thus, several recommendations are presented in order to delineate areas that should be examined further.

For one, several researchers suggest that direct descriptive assessments should be structured so that observations occur during specific activities or tasks. For example, a structured descriptive assessment may include situations that mimic functional analysis conditions (e.g., have caregivers read a book to simulate low attention, work on homework to simulate demand, remove toys to simulate tangible conditions). Unlike functional analyses however, no programmed consequences would be in place. This way information generated from the direct descriptive assessment may provide a closer approximation of an experimental analysis, while still maintaining the naturally occurring events. Structuring the observations around specific activities or events may increase the likelihood of establishing more consistent antecedents and consequences. In addition, it may increase the likelihood of gathering enough data in each antecedent category to make hypotheses regarding function. Some researchers have demonstrated that structured descriptive assessments may increase the validity of the assessment (e.g., Sasso et al., 1992; Freeman et al., 2000). Future researchers may want to compare the use of structured descriptive assessments to those that are more naturalistic.

A second recommendation for future researchers would be to incorporate a more refined data collection procedure in order to capture events not captured in this analysis. One refinement may be to incorporate scoring potential discriminative stimuli in order to observe additional variables related to the occurrence of problem behavior. One potential relevant discriminative stimuli may be the presence or absence of adults in the room. In this study, if the data collection program had recorded when an adult was present in the room (a potential discriminative stimuli signaling the availability of adult attention), we may have found that problem behaviors were more likely to occur in the attention-off category than in the attention-on category, when an adult was the room (i.e., ignoring that child), but not when the adult was out of the room (signaling the unavailability of attention). A variety of potential discriminative stimuli could be added to the data collection system including, but not limited to adult proximity, presence of academic materials, and the presence of preferred tangible items.

Future research could also benefit from conducting descriptive assessments that focus solely on an analysis of consequences. Based on the results of this study, an antecedent analysis was inconsistent in identifying behavioral function. However, the majority of previous studies have relied on a combination of antecedents and consequences in analyzing descriptive assessments. To date, no researcher has attempted to isolate the role of consequences in descriptive assessments. Examining the role of consequences in identifying behavioral function would provide information about the relative importance of consequences in identifying behavioral function. If, for example, future studies find that an analysis of consequences are useful to predict behavioral function, then practitioners would be able to consider more favorably the consequence analyses, when the results of a consequence and antecedent analysis did not match.

Finally, additional studies may aim to validate the results of descriptive assessments not by comparing the results to functional analysis, but be demonstrating that treatments based on descriptive assessments are effective. Over the past 20 years, the functional analysis methodology has been repeatedly demonstrated as an effective assessment because treatments based on this assessment methodology were effective.

Similar demonstrations with descriptive methodologies would enhance the evidence that this method of conducting descriptive assessments is useful.

Summary

To date, direct descriptive assessments (e.g., scatterplots, ABC, real-time) are used to conduct functional assessments of problem behavior. Unfortunately no method has been consistently useful in identifying functions consistent with those of a functional analysis. One purpose of the functional analysis methodology is to identify effective treatments. Continued use of methods with limited validity may be detrimental since they may interfere with the ability to identify effective treatments. The results of this study suggested that an analysis of antecedents occurring in the natural environment provided limited information regarding the function of problem behavior. However, this study did indicate that the use of visual analysis rules to stop descriptive assessment data collection prior to statistical analysis may be as beneficial as an arbitrary selection of total hours for data to be collected. Continued research is needed in order to identify methods of functional assessment that are reliable, valid and practical.

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BIOGRAPHICAL SKETCH

Melissa Hale was born in Fairfax, Virginia, in 1973 to Lois and Geoff Hale. She has two younger brothers, Oliver and Adam. Melissa lived in Miami, Florida, for 17 years before moving to Gainesville for her college education. Melissa graduated from the University of Florida in 1994 with her Bachelor of Science degree in psychology. In 1996, she entered a graduate program in school psychology at the University of Florida. Melissa was awarded her Master of Arts degree and Educational Specialist degree in 2000. She recently completed pre-doctoral internship at the Kennedy Krieger Institute in Baltimore, Maryland.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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